2-22-2019

Center for urban ecological dialectics at Mill Street: A living building in Geneva, New York

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A Thesis Submitted in Partial Fulfillment of the Requirements for the Degree of
Master of Architecture

Department of Architecture

Golisano Institute for Sustainability

Rochester Institute of Technology

Date of approval: 22 February 2019

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Abstract

Protecting drinking water and emphasizing a need to understand historical watersheds benefits urban ecologies. Geneva, a City in New York State (USA) is to invest in its economic future - especially regarding water for greater public use. To this end, an educational and experiential center in Geneva shall inform the public of a creek's valuable sub-sources and its own important municipal hydro-geological features. Focusing on the city's Castle Creek topography, a comprehensive design is developed adjacent to the creek's urban density combined with a goal towards preservation. Existing watershed education programs, socio-ecological connectivity, and public recreation are the stimuli informing ecological behavior around the creek as a means for better treatment of connected public stormwater systems within its parks, and public-use spaces. This thesis makes the recommendation for the case of opening up urban natural water-spaces (river daylighting) and establishing a center of ecological education, interpreting daylighting, for greater public dialogue between academic scientists and laymen. Considering all urban environments, a built center of excellence (Center for Urban Ecological Dialectics, or CUED) shall be developed to address these needs.

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It is through the dialectics of form and function in architecture, and in particular in the contradiction between the two, that the artistic and aesthetic dimensions of architecture can be developed: its expression of ideas, reflection of human identity, its ethics of responsibility to engage human culture, and its beauty. Architecture is capable of facilitating intellectual development, and of expressing ideas which transcend its material, programmatic and structural functions; in short, architecture is capable of being art, or poetry. Through its forms, and in the dialectic between form and function, architecture is capable of expressing important aspects of individual and cultural identity, as a humanistic art form. As a form of artistic expression, architecture can have more value in people's lives.

—John Hendrix, The Dialectics of Form and Function in Architectural Aesthetics. Architettura, 2015

The tourist who visits Geneva and is at last obliged to tear himself away from its charms, always carries with him, according to his own account, enduring memories of our attractive and picturesque environs; the whole town offering advantages that but few places equal and none surpass. But one improvement is lacking, a great public park. The Superintendent of the State Experimental Station, who is an enthusiastic advocate of this scheme, intends sometime if possible to utilize a large natural glen and woods on the Station, and with the help of a landscape artist turn the same into a "Wild Garden." Then we should indeed have a place where all might revel.

—Nasr Ed-Din, Glimpses of Geneva: Parks and Pleasure Places) – from Geneva Gazette 3, September 1886

CHAPTER I: INTRODUCTION

Background

Previous research into a description of Geneva after the 1790s conveys both the pastoral environment around this settlement and how closely the people of this agrarian community lived in harmony with nature. A picture of this time span, within Geneva, is captured in the illustrations seen in Figures 1 and 2. The homes in the settlement and the surrounding farmers depended heavily on the waters of both Seneca Lake and Castle Creek for cooking, cleaning, bathing, and irrigation. Geneva officially became a city in 1897 (Bulletin of the New York Public Library, January 1912), yet its connection to the creek may or may not have entirely altered it (depending upon where specifically they were rooted or from the industries adjacent to it). Caroline Carr, a local college student researcher, stated in a website presentation (2014) that Castle Creek was a "unique and vital water source, that connected Geneva to Seneca Lake" and which "upholds water cycle, promotes biodiversity. . . and that its importance has been forgotten" (https://prezi.com/dfiac2toocjk/castle-creek). The Geneva Historical community has also documented the aspects of similar archaeology. Several problems regarding the cultural landscape of Geneva, are that, like many communities across the United States, vernacular architectural origins are lost and buried beneath layers of asphalt. Thus, important archaeological and interpretive information becomes inaccessible because cultural linkages are broken or irretrievable.

Figure 1. 1807 Map of Geneva (Geneva Historical Society, 2015, retrieved from Geneva Historical Society archive collection.

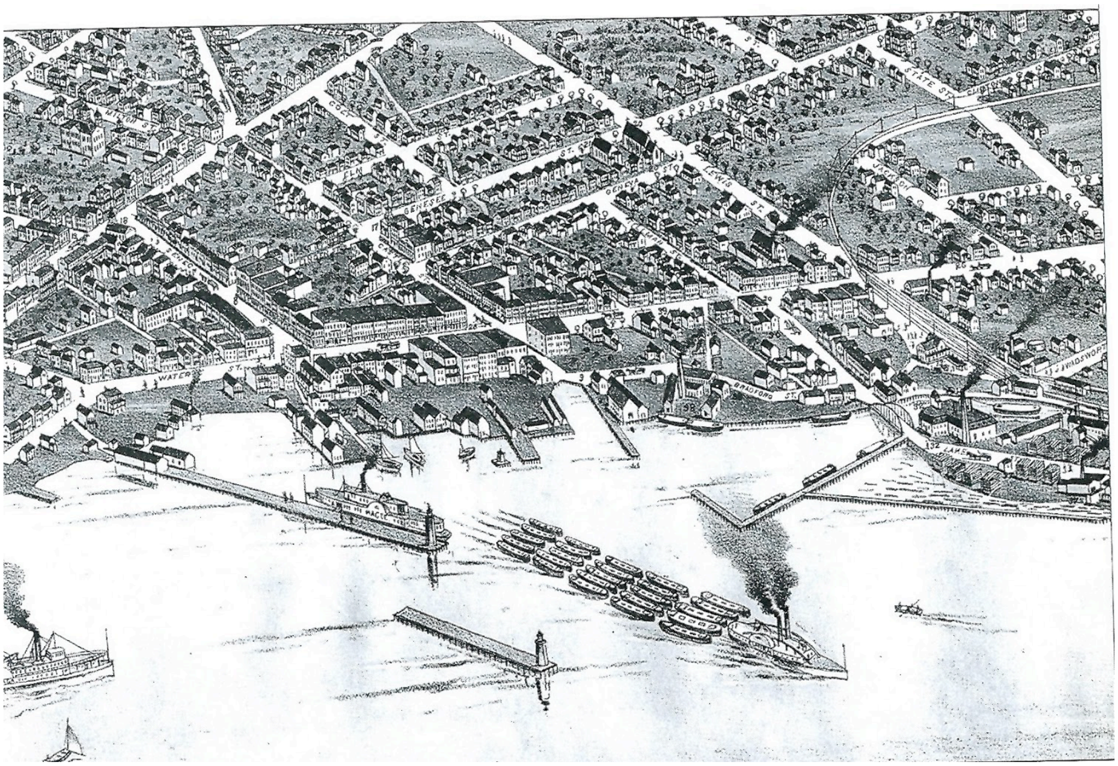

Figure 2. Geneva commerce, centered around the outlet of Castle Creek at Seneca Lake 1873 print showing the Village of Geneva (Geneva Historical Society, 2015. Retrieved from http://4.bp.blogspot.com/-wOBZ7Orae5A/ULaWHx38PAI/AAAAAAAAABQ/HlYQ3vBkohY/s1600/geneva6-1.jpg)

Long before European settlers arrived in the area, the waters of Castle Creek were considered sacred, so much so that an Iroquois Nation settlement forbade its community members to bathe in it because it was considered wrong to do so (Carr, 2014). At the stockade known as *Kanadaseaga*, a village-like community, residents used the creek for its drinking water and abundance of fish—as it was a highly valued resource for its agriculture and surrounding lands (Carr, 2014). Lewis C. Aldrich and George S. Conover (Ontario County Genealogy Record's historians) state in their *A History of Ontario County, New York* that this community referred to the creek and its surrounds by the name Kanadaseaga. (Aldrich & Conover, 1893, paragraph 12) By the early 1800s, Native Americans were forcibly driven from Geneva, as a result of General Sullivan's Expedition of 1779.

The Seneca town of Kanadeseaga was located near to where modern-day Geneva is situated. The settlement of Kanadeseaga was situated on a hilltop, approximately 1–1 ½ miles from Geneva's current city center. Also near this hill were several valuable wetlands that were the surfacing, clean source for the mentioned creek. Other accounts, taken from the collection *A Historical Sketch of the Indian Landmarks at Geneva, N.Y.,* published in 1909 by the Secretary of the American Scenic and Historic Preservation Society, reveal the relation of the Kanadeseaga village to Castle Creek, then called "Castle Brook." The name change to Castle Creek has endured. The earliest accounts of the area are provided by Moravian missionaries of the early 1700s who documented the presence of Kanadaseaga on "fertile farmlands", north of Castle Brook. An account recorded by the Secretary of the American Scenic and Historic Preservation Society confirmed this and suggested that the fortified stockade or "castle" of the settlement may have been the source of the creek's English name.[1] According to Conover and Aldrich (1880), after Kanadaseaga was destroyed by the Sullivan Expedition in 1779, the first person to acquire much of the land along Castle Creek was former Revolutionary War Lieutenant Colonel Seth Reed. In 1787, Reed had negotiated with a faction of the remaining Senecas to acquire much of the fertile farmland that today makes up the Town of Geneva.

The Village of Geneva was established in 1806. The Geneva Courier of

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[1] Geneva Courier, Mar 17, 1880: Geneva, NY within NYS Historical Newpapers.

March 17, 1880, states that the "Village of Kanadaseaga, being 'split into both sides' by what was "Kanadaseaga Creek", later became known as 'Castle Brook'" (NYS Historic Newspapers.org).

Since then, gradual conversion of natural lands into urban and suburban developments has contributed to the demise of Castle Creek, particularly at the parts nearest to Seneca Lake. Fortunately, most of the creek and its tributaries are still surrounded by large trees. Castle Creek stretches as a meandering brook and remains visible on the residential west side of the city. Those living next to the creek can hear it's babbling sounds when it is flowing robustly. In the more central, built-up portions of the City of Geneva, the creek is not heard because it is contained within tunnels. According to Dr. John Halfman (Professor of Geoliminology and Hydrochemistry) of the Finger Lakes Institute (2014), nutrient loading, also known as eutrophication, primarily from large-scale agriculture is increasingly contributing towards the ecological deterioration of the lake. In the mid 20thcentury, large industries were built on Castle Creek and local manufacturers began exploiting the creek through the discharge of glass manufacturing by-products. Glass manufacturing thrived in Geneva from 1873 until 1963 (Geneva Historical Society). Castle Creek, which flows towards the Eastern border of Ontario and Seneca counties, was also a prevailing gently carved terrain cradled and formed by the waters. This hydro geomorphing allowed for the creek to meander east. It's still meandering down toward the lake but as an interrupted stream within a city.

That once ample supply of clean, refreshing spring-fed waters, prized by the Kanadaseagans, began to be channeled and tunneled underground by 1880. Today in the Village of Geneva, a dense network of streets still covers the creek east of North Main Street (Geneva Historical Society). More than a hundred years later, Genevans either believe that (a) the creek is on the brink of revitalization, as one section near the lake has been restored as part of Geneva's lakefront revival efforts, or (b) see the creek only as a menace to property values and a contributing blight on the city.

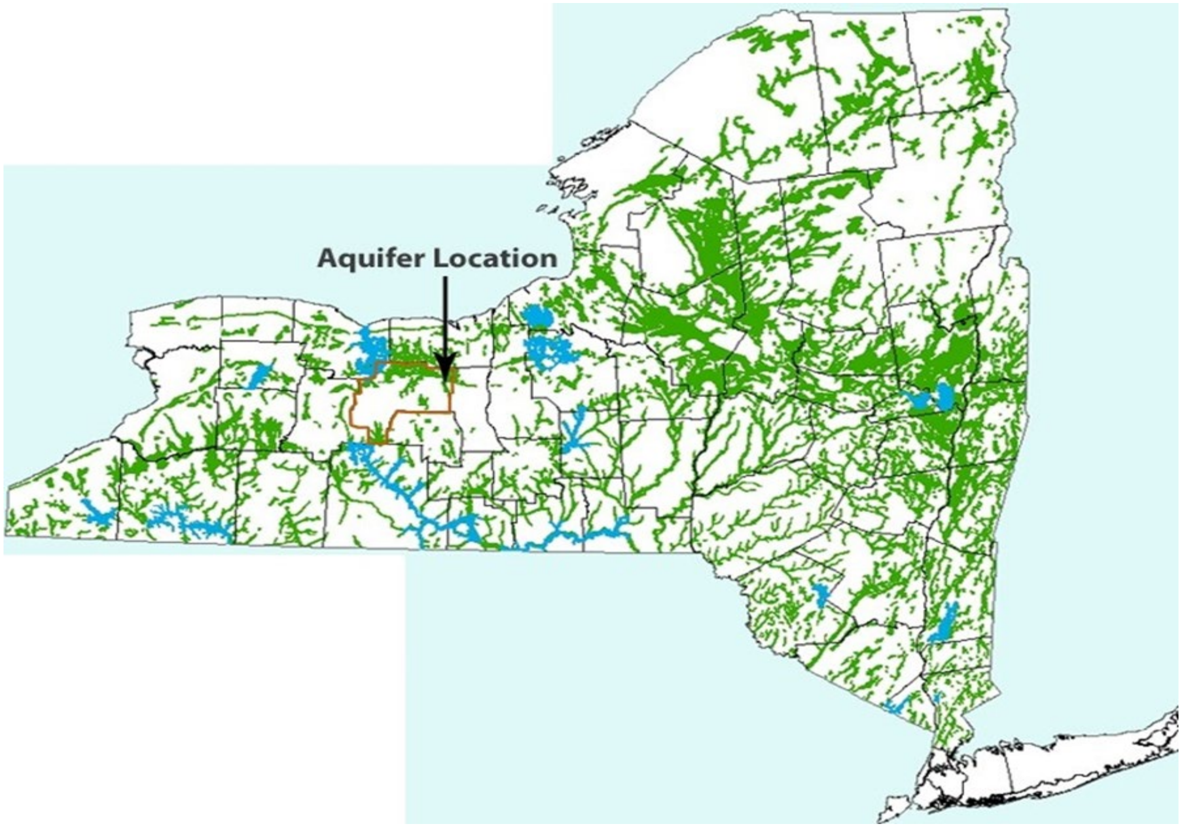
Hydrogeology Of Castle Creek

A central tenet of this paper is that the urban landscape is largely affected by groundwater quality and understanding the vitality of artesian water from a creek's source is of critical importance. To better understand this issue, a micro-scale aspect of this study focuses on Castle Creek's sourcelands. However, the complexities of the creek, or any creek for that matter, must be first deeply understood in order to investigate what lies below the surface, thus a geological emphasis and approach is required. A limited number of detailed studies have been conducted on Castle Creek since 1988. The *Unconsolidated Aquifers in Upstate New York - Finger Lakes,* by Todd S. Miller (1988), shows a descriptive mapping of the same location and it strongly supports all the hydro-geological information used in this paper. Surface evaluation relies on stratified information. The studies of collected samples and empirical observations are referenced and investigated through field studies and site photography. Additionally, hydro-surface evaluation relies on excavated ponds. According to the United States Department of Agriculture – Natural Resources Conservation Service, excavated ponds are affected by depth to a permanent water table, saturated hydraulic conductivity (Ksat) of the aquifer, and quality of the water as inferred from the salinity of the soil. Depth to the bedrock and the content of large stones affect the ease of excavation (USDA NRCS, 2014). The water is driven to the surface by underground pressure known as hydraulics (USGS, 2014).

Ontario County GIS information shows the aquifer in a current mapping (Figures 3–4). This *confined aquifer* is the source for the flowing creek and is active, producing anywhere from 5 to 500 gallons per minute, pushing up through sand and gravel overlay by till, very fine sand, silt, or clay (USGS, 1986). Understanding how the water originates from this aquifer and how it ends in the Seneca Lake basin is critical to the basic knowledge of the creek. According to their 1962 report, *The Ground-Water Resources of Ontario County, New York: New York State Water Resources Commission Bulletin GW–48*, by Frederick K. Mack and Ralph E. Digman, the overall footprint of Ontario county covers exactly 649 square miles or 415,360 acres (Mack, 1962; Digman, 1962, p. 6). Castle Creek meanders over four miles to reach Seneca Lake. The creek is formed from three converging tributaries largely fed by elevated spring-fed marshlands and their capillary systems, both within the Towns of Seneca and Geneva. The confluence of two major feed streams forms Castle Creek before it meets a third from the same source. Excavated or spring-fed ponds are described by the USDA Natural Resource Conservation Service (1962) as “pits” or “dugouts” that extend to a ground-water aquifer or to a depth below the permanent water table. Castle Creek is supplied year round with cool temperature water. This area (the watershed) influences the Creek and roughly covers 10,250 acres, according to Finger Lakes Institute’s 2012 source map, which used GIS Metadata collected from 2002.[2]

Historically, some physical soil and water properties held in agricultural lands, have partially dammed up local marshland regions to create reservoirs from the underground springs, creating large ponds used for irrigation. Soil erosion, from many years of farming in eastern Ontario County, has contributed to the silt and soil runoff. Conversely, man-made attributes have at times been created. In 1960, one such pond/marsh was engineered by a past proprietor of Red Jacket Fruit Farms. The pond (after being created through damming) became a managed source capitalizing on the aquifer of Castle Creek (Joe Nicholson, Jr., 2015). Today, this large pond with an average depth of 2.4 feet occupies nearly two-thirds of a square mile. The creek's volume fluctuates in relation to the area's annual average rainfall. Another wetland, near Yaegel Road and west of Red Jacket pond, covered with trees, supplies the creek through various aboveground and underground capillaries. This area feeds the creek directly, partially supplying the Red Jacket pond before it feeds Castle Creek. Upon examination, the footprints of the two main wetlands and the pond (Figure 3 and Figure 4) are congruent with historical accounts as well as personal observations after visits to each. A third wetland, near Sutton Rd., is considered a forested wetland and is primary to Castle Creek.

[2] 2012. Castle Creek Watershed. Appendix 3. Finger Lakes Institute Cartographic Metadata, 2002



Principal Aquifer

Primary Aquifer

Figure 3. Groundwater Resources of NY State with Ontario County in Orange Boundary (2011). Retrieved from http://www.dec.ny.gov/images/water images/prinprim.jpg.

These surface reservoirs top off at an elevation between 740 and 770 feet above sea level, and its water descends almost three hundred vertical feet, to the basin of Seneca Lake. To give a full creek-to-ocean measurement, after the creek water become Seneca Lake water, it can be assumed that the emergent aquifer water from Sutton Rd., after first meandering all the way down to Lake Ontario, will continue and ultimately empty into the Atlantic Ocean through the Gulf of St. Lawrence—a distance of roughly 1,200 land miles.

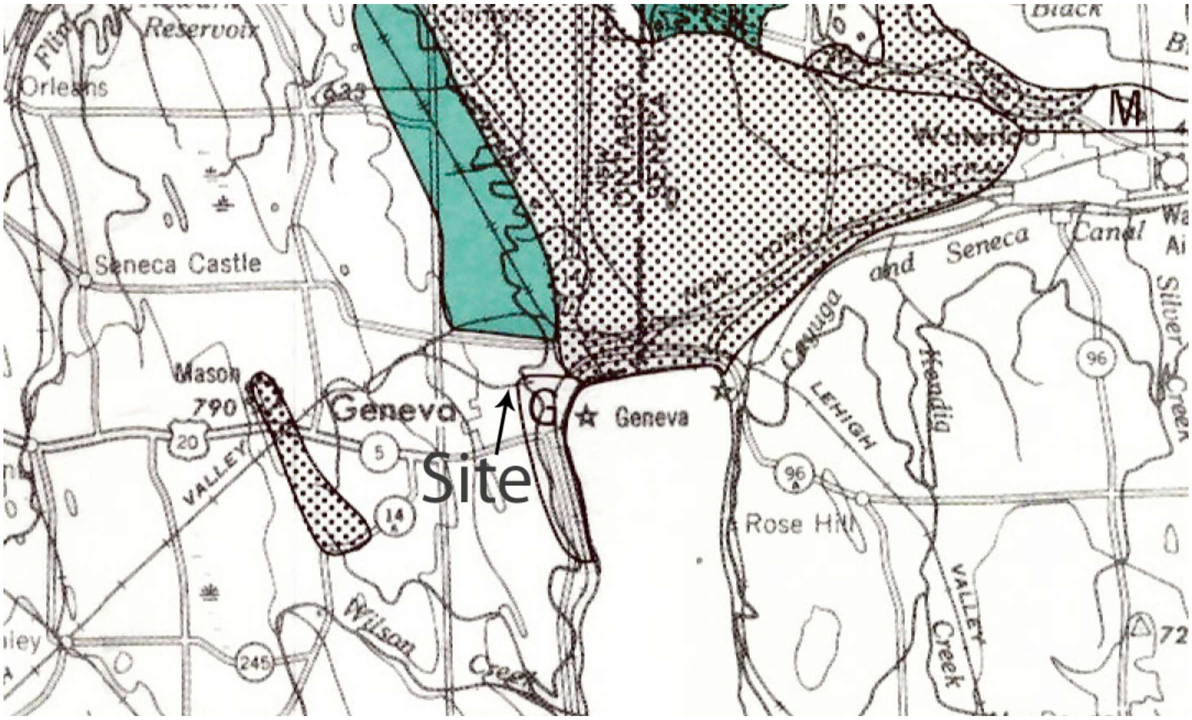


Figure 4. Map of confined aquifer and source of Castle Creek (USGS, 1986). Retrieved from http://pubs.usgs.gov/wri/1987/4122/plate-1_color.pdf

The hydrogeology reports and surface-groundwater studies of fifty years ago concluded that these spring sources could provide an abundance of water for years to come (NYSDEC, 1962). The 1962 geological study of this aquifer characterized it as having water steadily and consistently supplied to the creeks. Today, it continues to supply Castle Creek just the same as it did in the 1800s. A further explanation of this type of aquifer is explained in the Department of Environmental Conservation (DEC's) New York State 1962 report by geologists Mack and Digman. Their report, *The Ground-Water Resources of Ontario County, New York: New York State Water Resources Commission Bulletin GW–48* prefaced that

> Water that occurs in pore spaces or other openings in rocks is termed subsurface water. Such water occurs both in the zone of saturation and in

> the zone of aeration. The plane of separation between these zones is known as the water table. The zone of saturation lies below the water table and in this zone, all interconnected openings are filled with water. Water within the zone of saturation is called ground water. The zone of aeration lies above the water table and contains air and other gases, in addition to water. (Mack & Digman, 1962, p.16)

The report cautioned that development around this aquifer will also draw water out of the system, which is precisely what is occurring today.

> The importance of ground water in Ontario County is demonstrated by the fact that most farms, rural homes, some industries…obtain water from wells or springs… The building of new homes and the development of additional industries will doubtless result in a continuing increase in the use of ground water. (Mack & Digman, 1962, p.2)

A subsequent study, conducted in 1986, determined that the earlier study was inaccurate due to its use of incorrect scales (Miller, 1988). This provides an indication of how difficult accurate groundwater surveys have been to conduct. New research and methods are needed from geologists. The 1962 and 1986 reports have been used here loosely to best synthesize the language of hydrological and hydro-geological studies within a specific snapshot of the years leading up to this research. Understanding the relationship between the various layers of the aquifer, as well as the dependence of all human activities on this water source, is crucial to maintaining and protecting it for future generations. For this reason, an hydrogeological component will be central to the field of study, in a dedicated space, and will be discussed and shown in future chapters.

Biology Of Castle Creek

It is important to next address what this body of water supports in the web of aquatic life. Under the direction of John Halfman Ph.D., the Finger Lakes Institute has supported over 20 years of research on this subject. Halfman and colleagues' body of work connects to all creeks and streams in the Seneca Lake watershed and was done as a series of field studies. Additionally, Susan Cushman Ph.D., also of the Finger Lakes Institute and professor at Hobart and William Smith Colleges, has extensively studied the marine life of several major creeks within the Seneca Lake watershed. Her research along Castle Creek reveals significant amounts of benthic macro-invertebrates—plankton, crayfish, midges, clams, worms—and indicates the overall health of the stream. Thanks to this work, we know that Castle Creek does, in fact, support many small fish species such as dace, minnow, and perch (Cushman, 2011). According to Dr. Cushman, the more diverse a stream's macro-invertebrates the better the water quality of that stream. As an example (Figure 5), her research encompasses Castle Creek's aquatic life as being healthy as the chart shows an abundance in fish species.

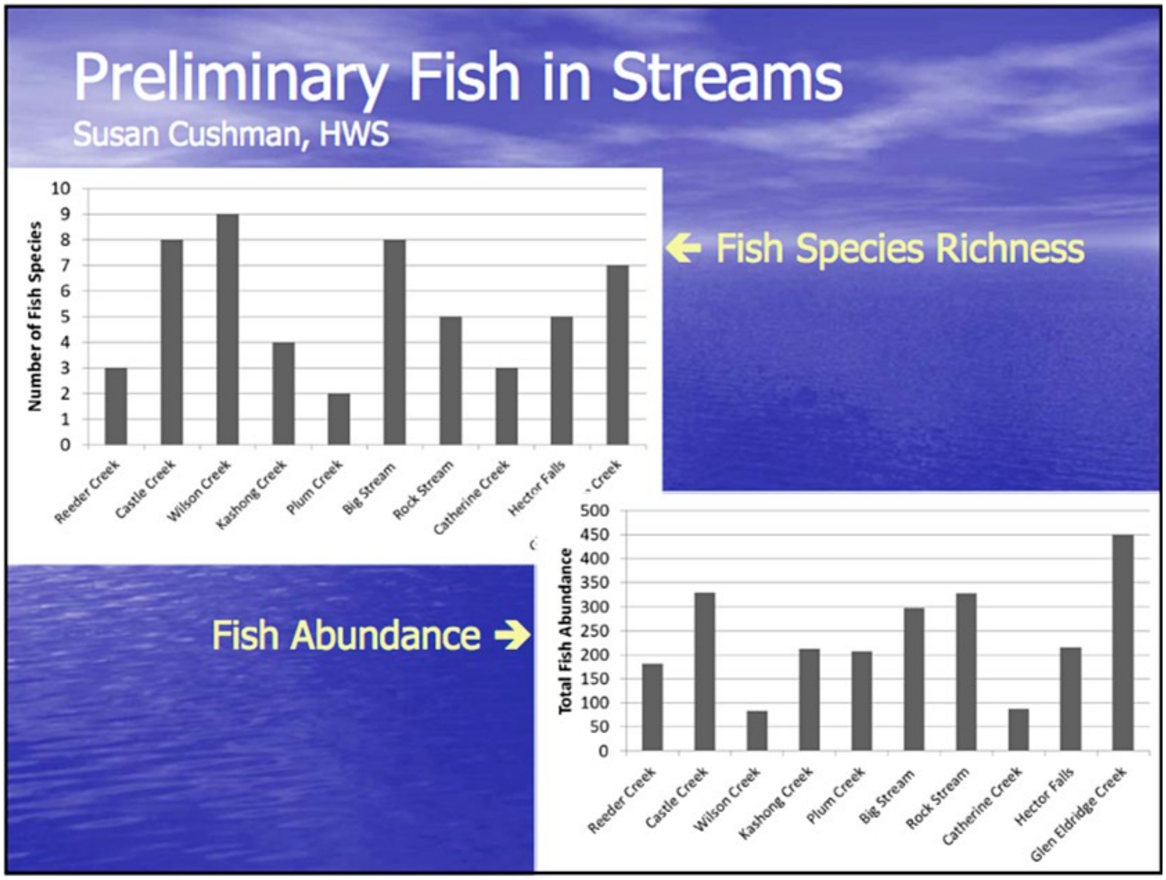


Figure 5. Preliminary Fish in Streams: Seneca Lake Characterization Report specific to all creeks in watershed, including Castle Creek. (Cushman 2012)

Given the health of the bottom of the food chain, it may be possible to reintroduce a fish population to the Kanadesega area. A tailwater environment might also be established with the building of a major dam in the town of Geneva. A tailwater engineered creek is defined as the portion of waters below a dammed pond, weir, or reservoir that usually offers rich amounts of food to fish in the stream because benthic micro-invertebrates accumulate in eddies below the dam. A dam could further repurpose the creek for additional activities such as sport fishing if water volume and flow-control were available. The introduction of recreational fishing to Castle Creek could be an attraction that would bring enthusiasts, young and old, into a prospectus for the creek. Thus, individuals could learn about fly hatching patterns and the contributions of benthic macro-invertebrates in ecosystems. Additionally, the New York State Agricultural Experiment Station's entomological research is housed less than one-eighth of a mile away from some of the creek's best rivulets and eddies and could serve as an important educational partner for a proposed ecological center offering fly-fishing to enthusiastic youth. The marshlands that feed the creek have long provided a terraced basin for the aquifer-fed water, and are abundant with small fish, ducks, beavers, herons, in addition to many frogs and toads. Biodiversity of this type is typical of undisturbed spring-fed marshlands. Still, a threat exists with development nearby.

Consideration of the drinking supply is also important because potable water (water after purification that meets health department requirements) will be used in this thesis' design. Data from the New York State study of geological features on aquifers, in Ontario County, offers insight into the actual consumption of spring water in Ontario County (Mack & Digman, 1962). Data from a 1945 abstract introduces trajectories (flow paths) consumed around the aquifer:

> Ground water is the principal source of supply for farms, rural homes, small industries, and several villages. The total use of ground water in 1957 is estimated to have ranged from 3,000,000 gpd (gallons per day) in the winter to 5,000,000 gpd in the summer. In some areas, only small supplies can be obtained, and in other areas, the ground water is not of usable quality, but the overall supply of water is not only adequate for present demands but also is capable of supporting substantially larger demands in the future. (Mack & Digman, 1962, p. 2)

The documented flow paths and volumes can help explain the vitality of the aquifer. According to personal observation and Mack and Digman's research, this author concludes that Castle Creek's source is indeed quite active, perhaps even beneficial to the community as an alternative source to lake water, like drinking water, or at least in limited capacities as spring water that can be further purified and bottled.

Agricultural and Historical Industries Along Castle Creek

The farming community is prevalent in this area. One hundred twenty-five years ago the Village of Geneva was less inhabited. Industry has prospered in this area and Castle Creek has been either a resource or the flush-out conduit for many commercial businesses. Additionally, agricultural commodities and shipments via the Seneca-Cayuga Canal resulted in increased development closer to the lake. Lake Street and Canal Street were conduits whereby agricultural and manufactured goods were transported to the lake, then to the Seneca-Cayuga Canal, before eventually being transferred to larger boats on the Erie Canal, and then out to the rest of the world (Geneva Historical Society, 2014).

Figure 6. Lock Number 1 (circa 1870's) (Geneva Historical Society 2015). Retrieved from http://nyheritage.nnyln.net/cdm/singleitem/collection/p15109coll6/id/2244/rec/285

(Figure 6) shows the position of such an urban infrastructure, which relied on the combined waters of Castle Creek and Seneca Lake as a canal corridor. In the late 1800s the Bausch and Lomb Company (now Sterling Optical) established a lens manufacturing facility in Geneva, near Castle Creek. The early optical industry produced large amounts of a zinc-oxide by-product known as *Rouge*, which was dumped unceremoniously into the creek. This byproduct was non-toxic to humans but stained clothing. The Rouge then leached into the lake and caused an aquatic occurrence in fish known as *yellow-boy*. Yellow-boy is also known as Acid Mine Drainage and is a phenomenon where the acidity of industrial runoff causes naturally-occurring soluble iron ions to precipitate out as iron hydroxide, an insoluble yellow and orange colored substance (Penn State University, 2009).

The east end of Castle Creek, near its outlet to Seneca Lake, became interred within the new concrete infrastructure in the early 1900s. This was most notable near the gardens of old Colt Street, east of Genesee Street, where the Creek was first entombed and remains that way today. (Figure 7), a 1978 local map, illustrates the imprint of the rail industry, which was drastically expanded when the Lehigh Valley Railroad bought out the Geneva, Ithaca, and Sayre Railroad in 1876 and constructed a rail station in Geneva.[3] For many years, the rail line straddled Castle Creek in order to respond to the increased demand for the transport of agricultural products, as seen in the far left portion of Figure 6. An 1880 article from the Geneva Courier described the creek lands as being destroyed by a road-bed of the Geneva & Southwestern Railway (Lehigh Valley Railroad Historical Society, 2016) that had been graded through a corner of the developing farm lands. (Geneva Courier, 1880, paragraph 1)

[3] Geneva Courier, Mar 17, 1880: Geneva, NY within NYS Historic Newspapers.org [*NYS Historic Newspapers Project NNYLN Potsdam, New York*]. (http://nyshistoricnewspapers.org/lccn/sn83031163/1880-03-17/ed-1/seq-1.pdf)

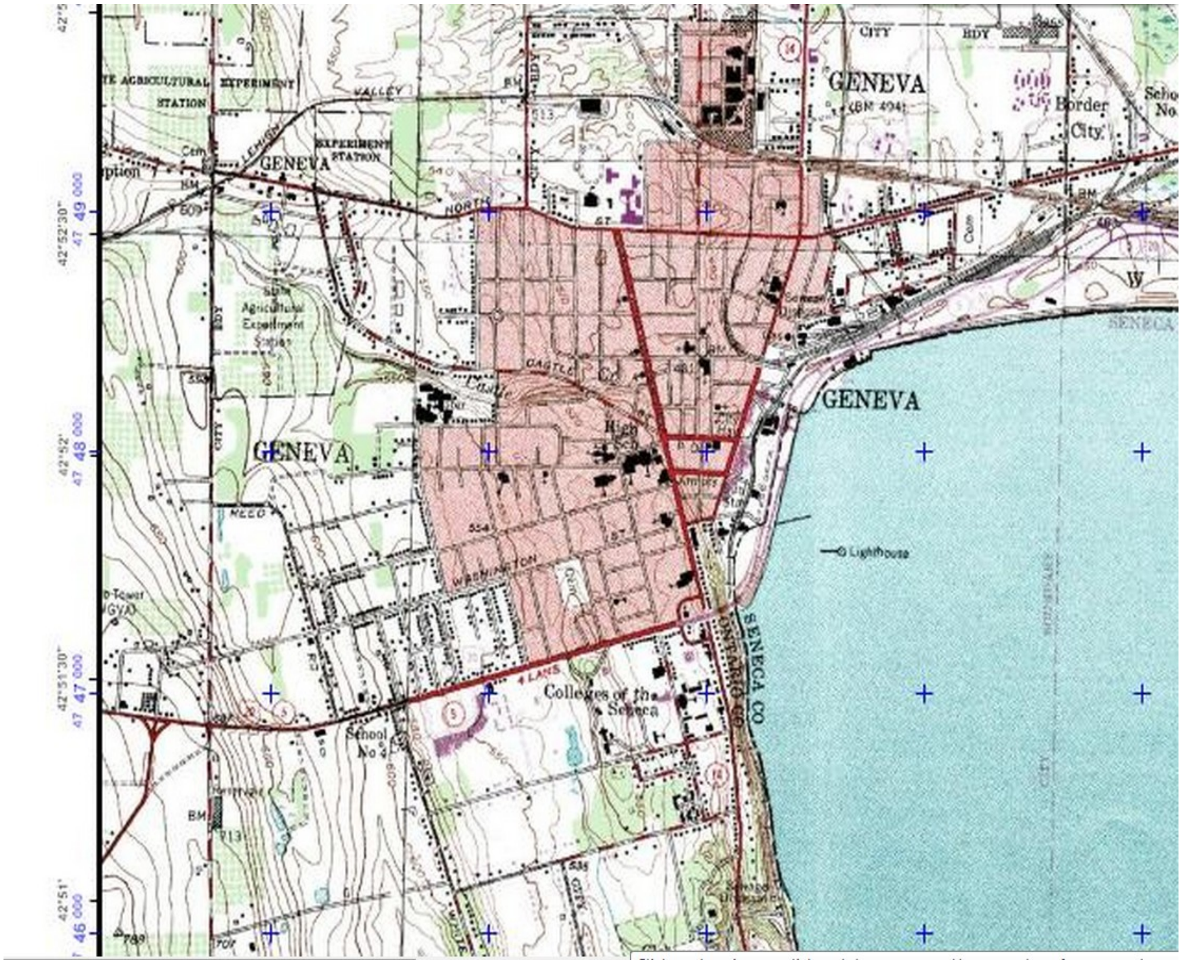


Figure 7. 1978 Contour Map showing Geneva's urban density (USGS, 1978). Retrieved from http://www.topozone.com.

Today, these industries no longer rely on Castle Creek for their manufacturing processes. The agricultural industry, as the largest industry in the area surrounding Geneva, continues to have an environmental impact on the creek and its watershed. According to Dr. Halfman's (2008) Water Quality of Seneca Lake, NY: A 2007 Update, 46% of the Seneca Lake Watershed is made up of the agricultural landscape. Within Geneva itself, environmental planner and landscape architect, George Frantz, recommends that the city increase its agricultural and open spaces until they comprise 72.3% of the total area (Frantz, 2015). However, the impact of past, present, and current toxicity trends in the lake, stemming from agricultural eutrophication, is a continuing concern in the community and may have to do with general farming practices used in food production. Non-profit lake advocacy organizations such as Seneca Lake Pure Waters Association (SLPWA), created over 30 years ago, monitors lake water quality. SLPWA works closely with The Finger Lakes Institute and area water quality experts to provide health reports to the public on matters such as blue-green algae blooms and the health of fish in creeks, and in the lake. Farmland dominates the Seneca Lake Watershed, and to prevent agriculture around Geneva from continuing to operate in the same "business as usual" fashion, further advocacy will be required to develop greener solutions for Geneva. The environmental impact of Geneva's many industries, past and present, is a key aspect of the educational role for the envisioned goal that will be further discussed in chapter 3.

The City Beautiful Movement in Geneva

The *City Beautiful Movement*, according to the noted architectural historian, Thomas S. Hines, was a reform movement that sought to couple traditional aesthetic design with modern innovation to make cities more attractive and create harmonious spaces. Hines noted that the general shapelessness of American cities was due in large measure to the extraordinary speed with which they had developed during the Industrial Revolution (Hines, 2004). Geneva, although a small city, has exhibited many of the poor planning features of its larger industrialized peer cities. To offset its urbanization, the City of Geneva developed Lakeside Park in 1917 (Geneva Historical Society, 2003) to fulfill the vision of a great urban feature park that paid homage to Seneca Lake. At that time, reflecting the City Beautiful Movement and addressing the needs of its residents and tourists, the City of Geneva set aside large tracts of land to create the park. As was the fashion in the late 1800s and early 1900s (Figures 8-10), the development of public park space and European style gardens were regarded by Genevans as a vital component to the city. A local historian, John Marks, contributed to the local newspaper segment *Way Back When in Ontario County* (Finger Lakes Times) regarding a local anomaly, which then made Lakeside Park a popular place to visit. Space occupied by Lakeside Park was once the site of Geneva's celebrated Lithia Spring. This spring produced mineral water so prized it won a medal during the 1901 Pan-American Exposition (Marks, 2014). As a result of this major award, 350,000 gallons of the mineral water was shipped around the world, under the name Geneva Mineral Water (Geneva Historical Society, 2003). This marks a significant point in Geneva's connection to industrial ecology because it was able to take naturally occurring minerals (i.e., lithium bicarbonate, sodium sulfate, calcium bicarbonate, sodium chloride, lithium chloride) and transform them into an ecologically viable business opportunity within Lakeside Park. However, the park's vision was drastically compromised in the mid-20th century due to the urban renewal missteps that shrunk the park, giving up space for erratic highway ramps, and also interrupted Castle Creek's access and direction near the lake.

Despite being reduced because of highway infrastructure expansion during the urban renewal efforts of the 1950s, Lakeside Park's legacy looms large in Geneva and has set the standard for public access and freedom from private and municipal development, which many Genevans still uphold along the lake (Finger Lakes Times, 2010). These standards are vestiges of the City Beautiful Movement with a focus on revitalizing waterways and highlighting the intersection of urban and marine environments. Today this movement is again influential, as an ambitious landscape design is rebuilt, making use of Castle Creek and revitalizing the old Lakeside Park mindset. Under this new design, the Lakeside Park of old has been reborn as a new *Lakeshore* Park.

Figure 8. View of Lakeside Park (Apex 2015). Retrieved from http://www.zapix.com/lord-of-ridley/genevaviews/pc66.htm

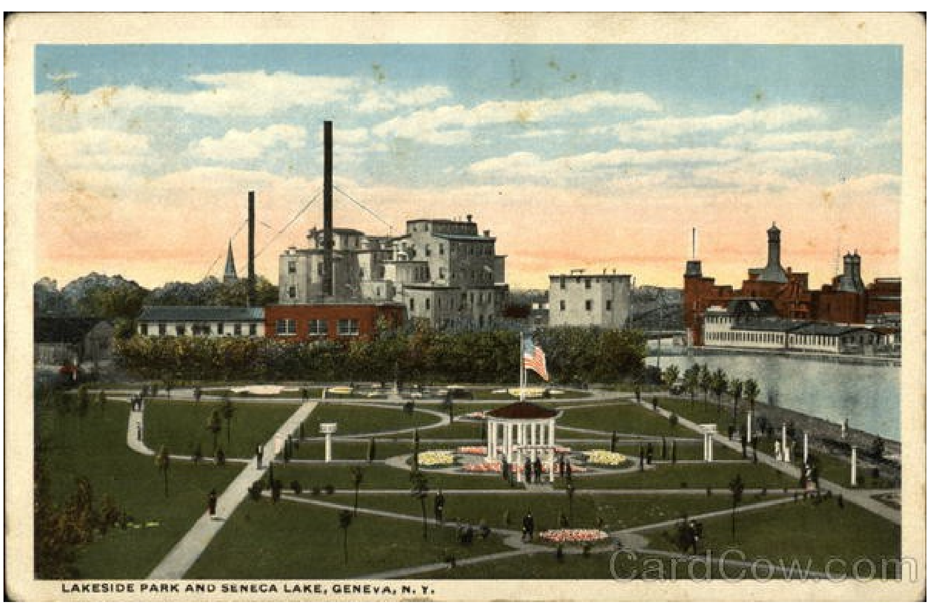


Figure 9. Lakeside Park – circa 1917 (Cardcow.com 2015). Retrieved from https://www.cardcow.com/445345/lakeside-park-seneca-geneva-new-york/

Since 1987 an early version of Lakeshore Park has been providing residents with recreational and mental relief from the area's growing commercial corridors, such as Routes 5 and 20. The lakeside, an open green space is seen as an oasis, a counter to urbanization. This protean *lakeplace* of Geneva does much of the same work as its ancestor from the early 1900s, and assists in facilitating a smoother flow of foot traffic in between the lakefront and the city's downtown. The open-space park has come full circle from the Lakeside Park of one hundred years ago. This same area paved the way for today's lakefront with vital green space and walkways slated for future development. New sustainable development is also slated to connect to Lakeshore Park.

One feature that has not changed much from Lakeside to Lakeshore Park is the conceptualization of the intersection of Castle Creek and Seneca Lake. The Creek portion of Lakeside Park was visible, but not easily approachable. More than a hundred years ago however, it was incorporated as an exposed element, part of a perfect example of an urban park, and where industrial activity and park leisure activities coexisted. Then as now, there are limitations to how far one can walk along Castle Creek, by the lake, because of the density of the city center. There was never an open space path, other than to explore the woods around the creek or canal. No grand greenway—a continuous or serpentine designed, narrow park—was part of the design. Often greenways are created around paths, small roads, and especially streams and rivers. Lakefront Park today has been repurposed with one such greenway that combines public art and open space for people with disabilities. It provides better access to the water's edge, access to public art displays, as well as more walking and biking space. The new Lakefront Park in Geneva invites promotes recreation and preserves the experience of the lake for those who utilize this enhanced space.

Accounts of Historical Landscape Near Castle Creek

Historians differ over how the creek got its name. Some suggest that the name "Castle" came from a prominent family who occupied a tenement property in the vicinity of the creek, whereas others note that there was also an "English shoemaker" by the same name (Geneva Gazette – 6 June, 1890). Most historians, however, remind readers that during the settlement period in the early nineteenth century, the English also dubbed the native Kanadaseaga town near the creek's headwaters, on the hill west of the current city of Geneva, as a stockade or Castle (Geneva Gazette, 1890). A close investigation of written records from the Gazette revealed a "Saw Mill" (Figure 10) near "Catharine" Street (now West Ave) and on a hillside near Castle (Geneva Gazette, 1890). This information has been ascertained from historical records and from maps from the period between 1829 and 1850. An article recalling the history before the 1850s reveals a settlement of interest:

> On the Hill beyond lived Philip C. Ruckle, a retired New York merchant. His sons were James, Philip, and John. Opposite this place, we find the Sam'l Codington family. His sons were Charles, John, George, Henry, William and Edward, and two daughters--Catharine and Caroline. Here was the celebrated dam and saw mill. (www.ontario.nygenweb.net/geneva1821.htm)

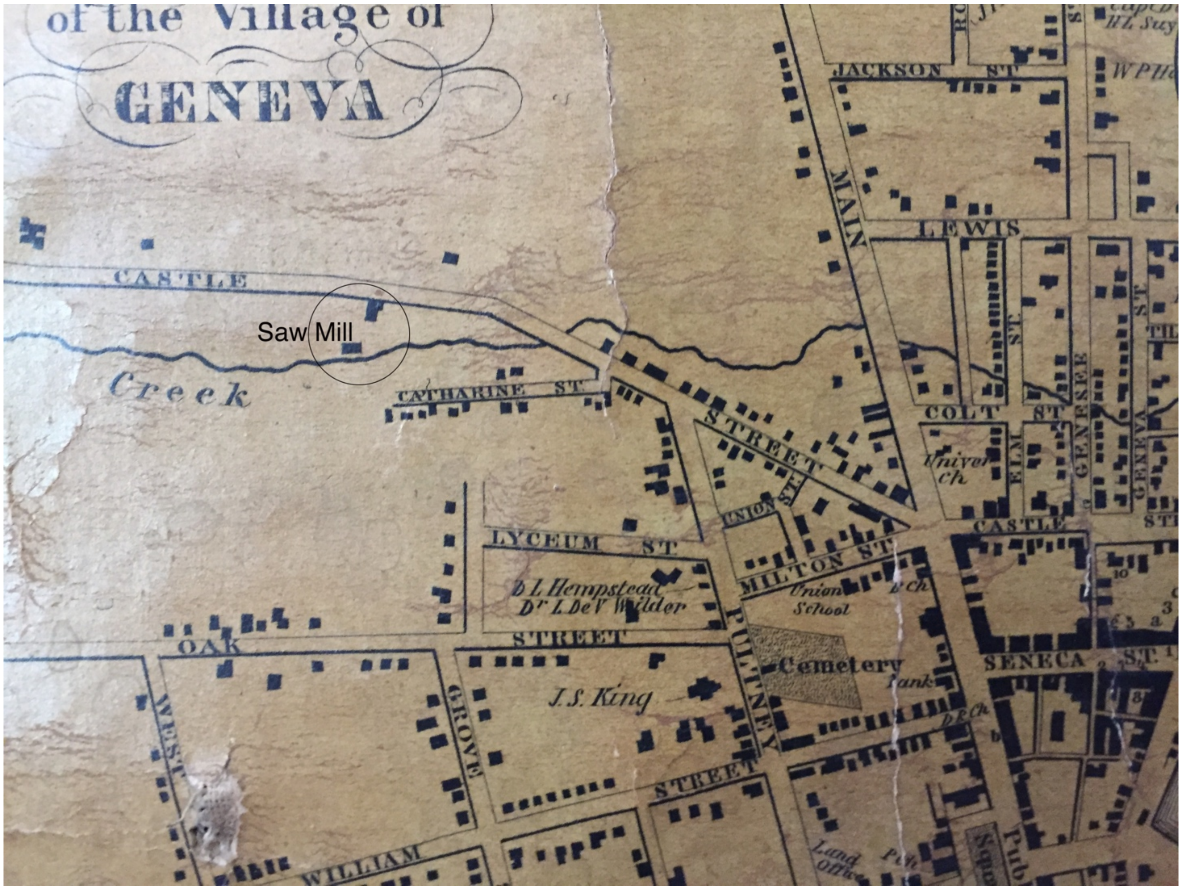


Figure 10. Circa1829 Map of Geneva (Ontario Historical Society, Granger Homestead 2017, retrieved from Ontario County Historical Society archive collections.)

A map, circa 1829 (Figure 10) of Ontario County, displayed inside one of the buildings at The Granger Homestead (Ontario County Historical Society) collection, in Canandaigua, NY, depicts in the legend a sawmill, near Castle Creek, on the north side. An 1850 map also documented the same building at the Granger Homestead and shows exactly where a sawmill structure would have operated at that time. Today, this space is a playground in Brook Street Park and part of the city's Parks and Recreation program. However, no physical remains of the mill can be found at the site.

Figure 11. 1829 Map Circa 1846 Map of Geneva (Ontario Historical Society, GrangerHomestead 2017, retrieved from Ontario County Historical Society archive collections.)

Castle Creek was also portrayed as a picturesque location in the writings of one of Geneva's foreign visitors or immigrants. A talented writer, Nasr Ed-Din documented a scenic portion of Castle Creek that also serves as the inspiration for this thesis. Nasr Ed-Din's articles from 1889-90 illuminate many of the unexplored "glens" near Geneva, mentioning Cromwell's Ravine [today, Wilson's Creek] and Slate Rock in particular. These articles did much to foster greater public awareness of the creeks and their connection to nature (Nasr Ed-Din, 3 Sept. 1889). Nasr Ed-Din's chronicles highlight the prevalence of a sense of urbanism in the late-nineteenth century Village of Geneva, often praising it's "metropolitan push and energy" (Nasr Ed-Din, 1889). He also notes that a

> tourist passing through our business streets is impressed by the activity and bustle alike visible and audible in all the conditions of street life. In fact, the true key to the character of our citizens is the daily aspect of our leading streets. (Nasr Ed-Din, 1889)

These observations link both urbanism with the vernacular of a thriving economy to nature all around it—one that mixes bucolic poetry with the pulse of a small city.

History of Geneva's Waterworks

Historically Geneva's early water utilities are described in the following manner:

> During the year 1796 the little village was provided with a water supply, by the formation of a company, followed by the laying of pipes from the White Springs, about one and one-half miles southwest of Pulteney Park, the pipes were of logs, ten to twelve inches in diameter with a two-inch bore through which water could be supplied to each house in the village. This was due to the energetic action of Captain Williamson and a few of his associates [who] laid log pipes from the White Springs, and thus furnished the village with wholesome water for all domestic purposes. (Conover & Aldrich, 1893, p. 266-268)

Historians have also established that most homes in the village were supplied with this advanced technology. Between the late 1800s and through the 1920s, Geneva's bustling economy allowed for the pavement of its dirt roads and the creation of its current network of streets. From the First Annual Report of the Board Public Works (1899), streets, waterworks, and sewer systems began to be documented as part of the municipal record (Figures 12b, 12c). At that time the aging wooden pipe systems (Figure 12a), installed in 1797 when Geneva was first settled, were replaced with clay tile and cast iron. Thirty-inch storm drains were buried to collect water from many of the adjacent streets and then directed the discharge into Castle Creek, eventually being released into the lake basin (Geneva Historical Society, 2003). Sewage followed, and the practice of fishing the creek quickly fell out of favor. Nowadays fishing in Castle Creek is considered somewhat archaic, however, this was not always the case. In the late 18th and early 19th centuries, an excellent fish population gave anglers a steady supply of food and brought people down to the water's edge (Geneva Historical Society, 2015). Today, Seneca Lake still is considered a great source for sports fishing, and since 1962 the city has co-sponsored an Annual Lake Trout Derby.

Figure 12a. Wooden pipe used to carry water from White Springs—a distance of 1.5 miles, to pump houses around the city (before 1848), with former City Historian, George Hawley Retreived from First Annual report of the Board of Public Works, Geneva, NY(1904).

STORM WATER DRAINAGE SYSTEM

In Use Previous to Dec. 30, 1897

	36 in.	30 in.	24 in.	20 in.	12 in.	Total
Cemetery Creek . .	2,550		1,400	1,480		5,430
Lewis Street	1,700	1,450	500			3,650
Toledo Street					1,100	1,100
State Street				1,600		1,600
Castle Street				800		800
East North Street			500			500
Middle Street				1,180		1,180
Total	4,250	1,450	2,400	5,060	1,100	14,260

Figure 12b. Streets with storm water drainage (before 1897) – courtesy of First Annual report of the Board of Public Works, Geneva, NY – 1904 (Geneva Historical Society, 2015). Retrieved from Geneva Historical Society archives.

CONSTRUCTED SINCE 1897

	8 in	10 in.	12 in.	15 in.	18 in.	24 in.	Total	Catch Basin
South Main			3262			350	3612	20
North Main			2202	745	457		3404	18
Washington			3186				3186	11
William			305	594	1440		2339	17 {4 in Hamilton S
Pulteney			2304		150		2454	27 2 in Milk " / 1 in Courtland "
High			595		32		627	5 2 in Park Ave.
Milton			60				60	2
Lewis			980				980	13
Geneva			392				392	5
Genesee			2241				2241	18
Lafayette			630				630	6
North			2140				2140	13
Sherrill			1290				1290	8
State			83				83	6
Seneca			466				466	6
S. Exchange			585				585	6
Exchange			950				950	15
Exchange, North of Lewis			1122				1122	9
Linden			170				170	2
Bradford			572				572	5
Lake			694				694	8
S. Wadsworth			606				606	4
Middle			156				156	4
E. Lewis	15	342					357	2
Tillman	26	294	25				345	4
Center		47					47	2
N. Exchange, brick		587	721		349		1657	17
N. Ex., macadam		45	24				69	3
Buffalo Street				561			561	
Central Avenue		12					12	2
Castle Street	233	94	838				1165	14
E. Washington		24				630	654	1
Cemetery Creek						120	120	
Castle Street						300	300	
S. Exchange			300				300	1
Seymour			273				273	3
E. North St	203	343	2400	220			3256	31
Lyceum	16	403	572				991	17
Brook				258			258	
Elmwood Ave		18	760				778	2
Elmwood Place		22	148				170	2
High St				425			425	
Cherry			20				20	4
Total	583	2231	31072	2803	2428	1400	40517	333

Figure 12c. Streets with storm water drainage (after 1897) – courtesy of 1st Annual report of the Board of Public Works, Geneva, NY – 1904 (Geneva Historical Society 2015). Retrieved from Geneva Historical Society Public Works Archive.

Flood of 1922

Flooding does occur, although usually only in close proximity to Seneca Lake. In researching historical accounts pertaining to the envisioned goal, where consideration of flood plains is extremely important, the only major accounts of flooding were found from archived newspaper articles. A recent Finger Lakes Times newspaper article in the Way Back When in Ontario County segment, written by City Historian Karen Osburn, describes the 1922 flood noting that “Castle Creek was not the only body of water to cause damage” (Osburn, 2016). However, the bulk of her article describes the largest of the city infrastructure failures near Castle Creek. One such story depicts the aftermath of a major flood that occurred on August 24, 1922, see also the images (Figures 3-14). The paper chronicled the many abutments and culverts that collapsed at three sites along the creek near N. Main Street. This excerpt from the local paper mentions a noteworthy investigation, and coincidentally is near one of two proposed site locations, discussed later in this paper. The nature of this flooded block was recorded in the following manner.

> The work of placing the new culvert, where Main street caved in over Castle Creek during the recent flood… Aside from rebuilding the Main Street arch there is a concrete wall to be replaced along Castle Creek near Oak street. The old wall was demolished during the flood…The new wall will be approximately 75 feet long… (Geneva Daily Times, 13 September, 1922)

Although the flooding, indicated in that archive, was 1000 feet east of the proposed site, the event is noteworthy since the surge of lake levels, combined with huge amounts of rainfall could potentially cause flooding in the future. Osburn's article also notes that "Over the years much work has been done on Castle Creek and the surrounding tributaries in the hope of ensuring this type of flooding does not occur again" (Osburn, 2016). In reviewing the 2014 FEMA flood map, there is reassuring information indicating that one of two proposed sites is not situated in a flood zone, although it is close to the site of the described flooding.

Figure 13. Castle Creek floods over Aug 24, 1922 (Geneva Historical Society, 2015. p 31). Retrieved from Images of America: Geneva's – Geneva's Exchange Street under water.

Figure 14. Pulteney St. during 1922 flood (NY Heritage Digital Collections 2015). Retrieved from http://cdm16694.contentdm.oclc.org/cdm/ref/collection/p15109coll6/id/2434

Seneca Lake

Recent geographical information has calculated that the lake has a total cubic kilometric volume of $16km^3$ (EPA), which means comparatively that Seneca Lake's measured volume is proportionally almost that of Utah's Great Salt Lake's volume of $18.9\ km^3$ (EPA, 2015). Seneca Lake's depth also rivals many lakes around the nation and is ranked 16th out of 1,360 lakes, based on its impressive depth of 618 feet (lakelubbers.com, 2016). Its considerable size brings agricultural prosperity to the region, the large volume of water rarely ever freezes over, and it helps to moderate winter temperatures, making the area suitable for vineyards.

Figure 15. 1962 Aerial View of Geneva (Geneva Historical Society). Retrieved from https://genevahistoricalsociety.com/exhibits/genevas-changing-landscapes/

Alarmingly, recent studies have indicated water quality is slowly being degraded by agriculture along the lake (Halfman, 2007). A 2005 study by Dr. Halfman concluded that lake water quality is diminishing from increased phosphorus and chlorine levels, stemming from agricultural runoff and unregulated septic systems along the lake.

The Finger Lakes agritourist industry has prospered, as a result of the unique microclimate afforded by the lake's depth and size, the number of cultivated acres (for wine) has increased. This has, however, increased the amount of commercial and private fertilizer runoff, which has negatively impacted water quality in the lake (Halfman, 2016). Halfman's (2016) research calls for better regulation to mitigate the increasing threat represented by such eutrophication. The Finger Lakes Institute (FLI) has compiled recent lake water quality data to inform the public about the research surrounding these claims (2015). Halfman's studies (2007-2016) demonstrate that the public should care about things like phosphorus levels in the lake that contribute to the growth in invasive plant species or algae blooms, which have negative effects on native fish species. A personal assessment of this was made by the author of this thesis, who as a fly fisherman, discovered an invasive species feeding on the food chain as a result of aggressive vegetation. The fish caught in 2011 is known as Common Rudd and the evidence was corroborated by a Cornell University fish specialist, who identified the catch from several photographs in a private collection. Studies from the Finger Lakes Institute show the publics' understanding of the biodiversity in streams, flow rates, toxicity from fertilizer runoff, as well as the impact of development on streams.

Summary

While specifically characterizing Castle Creek's environmental quality, it can be stated that erosion has been the greatest witnessed problem, despite Dr. Cushman's findings that state the creek supports life and is therefore stable, biologically. However, walking the creek and seeing many trees toppled close to the edge, bares evidence of climate effects and torrent events of water conditions geomorphing. Because soil root containment is washed away, this tells the tale of present geomorphological behavior within the creek topography. In listening to others' stories along the creek over the last 5 years, some residents have seen nearly 50' swaths eroded in their backyards, due to these conditions during superstorms. It's apparent and perhaps not unsurprising, that there have been some major rain episodes that have dropped as much "as 6 inches of rain in one day", as per an October 2016 recording of farmer, Joe Nicholson Jr. A local apple farmer, Nicholson consistently tracks rainfall amounts in his orchards and this observation is consistent with the erosion seen at Brook Street Park, in the city and with the stories of others whose yards are directly adjacent to the creek's path and flow.

This chapter has related the behavior of the larger local region around Castle Creek over a timeline categorically spanning several centuries. The historical attributes provided help define the culture of Geneva around waterways, parks and recreation, commerce, agriculture and industry. These physical effects related to each help shape the creek over time and mention local research specific to the water on Castle Creek. The philosophy and governance of community serve to protect or react to events around the creek contingent upon the relationship people have with the creek. It could also be stated that local government may not be enough to stop the ineveitability of biological plights of heavy agriculture, HAB (harmful algae blooms), and decreased water quality. These are topics perhaps for an. Other paper, especially because it can be seen that Castle Creek for the most part is a healthy stream, but that Creekside erosion still exists.

CHAPTER II: REVIEW OF RELATED LITERATURE AND STUDIES

> Global Warming has brought ecological design to the forefront of recent architectural journalism and academic debate. Despite claims to novelty, much of this discussion reflects back on earlier ideas. (Anker, 2002, pg.1)

Methodological Approaches

This chapter addresses the fundamental influences towards this paper's main topic: the pedagogy of urban ecology used in a building, as inspired by various literature representing important literary precedents. Urban design practices and approaches are considered both intricate and complex when introduced into an established pattern. City Planner, Kevin A. Lynch (1915-1987) is considered an expert in the field of urban design. The Dutch urbanist writer Michiel de Lange, suggests in a 2008 literature review of Lynch that he integrated mindfulness when thinking and recording cities. de Lange's review of Lynch's breakthrough book, *Image of the City* (1960), states, "It shows [that] urban space is not just composed of its physical characteristics but equally by representations in mental images" (The Mobile City, 8 May 2009). Lynch was a pioneer urban theorist, often asserting urban design criteria within complex fabric schema of individualized cities. Lynch has been key in developing philosophical applications towards contemporary environments. His books, including *A Theory of Good City Form* (1984), according to MIT Press' website offering of the text, "are essential reading" (mitpress.mit.edu, 2017). The American Planning Association's review of the book on their website suggests it is an excellent resource and integral toward "human values and the physical forms of cities" (mitpress.mit.edu, 2017). When applied toward the programming in this thesis, Lynch's work offers compelling literary support as this author has a desire to create permanent "ceremonial space" similar to those of Lynch.

Another researcher whose literature is important, is a past graduate student from the University of Maryland's Master of Architecture program, James Fitzsimmons. His thesis dealt with park and creek restoration in Baltimore, and he proposed sustainable building design to house a local environmental advocacy group in that city (Fitzsimmons, 2004). Fitzsimmons' research (2004), while providing concrete data in a consolidated format, is also written in a style akin to urban design and architecture. His work was especially strong in its approach to urban "weave," "infill," and "bridging" (Fitzsimmons, 2004, p.1) and similar to that of Kevin Lynch's philosophy. Though compelling, I felt Fitzsimmons' research style lacked characterization reflecting historical accounts of past eco-industrial typologies used in his location. Perhaps these weren't identifiable due to limited archaeological records, or the author had other limitations. His thesis, titled *Rediscovering Nature: Daylighting an Urban Stream (Gwynn's Run, Baltimore, MD),* identified criteria necessary to deliver the public a viable project but didn't provide an aggressive green building design performance model as perhaps a more recent version could have. LEED green building is touched upon, although it was not as widely practiced in 2004 as it is today.

Fitzsimmons writes, in the abstract, a desire to explore "the relationship between nature and the city" through "urban design and architecture" (2004, p. 1). This author also seeks to explain design using connectivity studies. Fitzsimmons' paper is credited as the inspiration to this author's paper especially concerning the topic of urban water. The specific examples and studies within his paper, as per planning aspects, are strong, historically significant, and functional as a design tool. The paper is important because of its connection to a stream's history in Baltimore.

Literature Supporting Urban Stream Revitalization

Water quality enhancement is a vital component of this work. An omnipresent situation confronting all consumers of public drinking water is nutrient loading caused by fertilizers containing heavy metals that damage watersheds. The literature highlights this pattern or unintended consequence, known as *eutrophication*. Eutrophication directly supports invasive plant life that can choke out beneficial hydrophilic plants, the source of food to aquatic wildlife. Invasive plants can become a problem in lake waters, and new invasive species of both fish and plants, make it harder for native fish species to acquire food. The information used for this thesis deals primarily with public domain creeks and streams and the policies that govern them. According to a water quality advocacy group American Rivers, within their significant 2014 publication: *Daylighting Streams: Breathing Life into Urban Streams And Communities,* "Retrofitting existing impervious areas, using techniques including daylighting, could substantially improve water quality as these areas are significant sources of pollution contribution from existing developed areas" (Daylighting Streams Report, 2014, p.17). However, the implementation of such programs relies on how well cities are able to conduct public surveys on their hometown streams and how well they convince their constituencies to invest in sustainability projects like daylighting. Therefore, it is vital that populations understand exactly both what needs to be studied and how to study it in order to ameliorate the impact of urbanization. The United States Environmental Protection Agency (EPA), as far back as their 2000 report, *The Quality of Our Nation's Waters A Summary of the National Water Quality*

Inventory: 1998 Report to Congress stated,

> Of the assessed stream miles, 55% are rated as good, 10% good but threatened, and 35% impaired. States and other jurisdictions assessed 42% of the nation's 41.6 million acres of lakes, reservoirs, and ponds and reported that 46% of assessed lake acres are rated as good, 9% good but threatened, and 45% impaired. (EPA, 2000, p. 1)

Much more local data is required to make the case for the daylighting in Geneva but further explanation will not be addressed in this report due to time constraints that limit the feasibility of a separate and thorough undertaking.

Literature Supporting Urbanism

In areas of cities where riparian zones have been erased, such as Geneva, crumbling concrete culverts are overstressed and structurally failing. In one-hundred-year storm scenarios, this weakened infrastructure can fail catastrophically, as evidenced in the Penn Yan flood of 2014. That flood, according to the Finger Lakes Times, a local newspaper, was severe enough that "parking lots collapsed underneath cars" (Hibbard, 2014). The argument that cities should begin to adopt systems strong enough to weather climate change events has been gaining momentum, especially after considering the devastation wrought inland by the heavy rains that followed in the wake of hurricanes Irene, Katrina, Sandy, and Matthew. Architects and planners, Andrés Duany and Elizabeth Plater-Zyberk (DPZ) have developed designs integrating community by contextualizing characterization zones known as "Transects" (Duany & Plater-Zyberk, 1980). As urban designers, they have identified areas where improvements can be made to alleviate the primary and perennial breaching associated with flooding. This literature review considered several of their overall ideas as they have, since the 1980s, prolifically helped develop criteria for sustainable designers. This body of work is represented in their *Congress for the New Urbanism (CNU) (*Duany & Plater-Zyberk [DPZ], 2008) addresses what's best known within the context of their Center for Applied Transect Studies (CATS) and was used early on to execute principles in sustainable urban design. Contrasting Lynch, CATs' resemble his theoretic approaches, mapping behavior, and graphically generating specific patterns, diagrammatically, while reflecting more modern topics, in particular resiliency in design. DPZ's body of work presents case studies of a wide range of urban examples.

Not necessarily architectural designers, traditional earth scientists perspectives are relied upon for this paper. Well before DPZ, environmental researchers were primarily concerned where the geomorphology of rivers, creeks, and streams suffer due to their inability to return to normal functional levels after major flood events. The study of erosion control relates to the physical and chemical processes that have shaped the earth's topography. Several scientific visionaries have also helped serve as the inspiration for this thesis. One, in particular, Aldo Leopold (1887–1948), contributed to the field of conservation. An American author, scientist, ecologist, forester, and environmentalist, Leopold is best known for his book *A Sand County Almanac* (1949). According to the editor responsible for compiling this important research, within *Aldo Leopold: The Man and His Legacy* (1987), he emphasized biodiversity and ecology and was a founder of the science of wildlife management (Tanner, 1987). Aldo was also influential in the development of modern environmental ethics and in the movement for wilderness conservation. His ethics of nature and wildlife preservation have had a profound impact on the environmental movement (Tanner, 1987). His son, Luna (1915–2006), a noted geomorphologist himself, further advanced his father's research, which has led to what we now call stream daylighting practices. Luna was affiliated with the US Department of Geology and received degrees in Civil Engineering from the University of Wisconsin, Madison; Meteorology, from UCLA; and a Ph.D. in Geology from Harvard. According to a 2013 interview conducted in by Ruth Ostroff with Eric W. Larsen, Faculty, Associate Research Scientist, in the Department of Environmental Design, Landscape Architecture Program at the University of California, Davis; Luna Leopold, it is summarized – respected the natural inner workings in nature. It is also stated in this interview how Leopold chose to conserve rather then force his beliefs on nature. He respected the existence of things in nature. (https://humanecology.ucdavis.edu, 2013)

During the past decade, numerous studies and research have further developed Luna's work and many have broadened our understanding of how natural water pathway planning might mitigate the effects of urbanization. Leopold's studies offer insight into the geology bisected by Castle Creek, which could have been especially susceptible to geomorphological alterations from crumbling infrastructure within the city of Geneva. This scholastic research has found that the geographies of several American cities have undergone vast transformation and geomorphological pattern changes. Most analyses use data gathered from as far back as 1900 when modern mapmaking practices were implemented in many municipalities. Maps of earlier passages of waterways are unreliable because the soil structure surrounding streams had been either eroded, removed, or disturbed to the point that it is no longer the same topography. While the U.S. Geological Survey (2013) has recently published new regional New York State data and maps, not enough geomorphological data is available for chronologies on Castle Creek. It has to be assumed, based on empirical information from newspaper articles on major flood events, records, and personal photographs, that erosion and infrastructure repair has been ongoing since Geneva first became a city.

Literature Supporting Biophilic Design

The built environment concept—the notion of a space or building relating to human physiological use within the outside environment—uses biophilia to conceptualize how people relate to other life forms irrespective of the buildings themselves. In further criteria examinations of similar type buildings, one approach to the built environment that stands out is biophilia, one of the core precepts in the Living Future's Institute (LFI) Living Building Challenge design approach (LFI, 2015). Biophilia refers to the human affinity with and responsibility towards all living things. But it goes far beyond that and the practice of a good biophilic design fosters awareness of the numerous habitats and species around the world. While green building design may focus on the best practices of comfort levels, natural materials, natural light illuminating space, color temperature, healthy ventilation, and several of the factors regarding human consumption in rooms and dwellings, biophilic designs highlight all scales affected by humans and buildings.

The biophilic construct works well within Lynch's concepts of urban design and with those of The Congress for New Urbanism because these philosophies are centered on how people will feel in the design. The latter making a special connection as it introduces holistic connectivity that is complementary to natural social and biological elements—biophilia is often described as an immeasurable tendency or habitual affinity that is difficult to quantify. But the research team of Stephen R. Kellert and Judith Heerwagen, an ecologist and an environmental psychologist, importantly explore the reciprocal balance between human aspirations and the effects of the built environment on nature. Their work and attention to considerate design principles have been incorporated in many green buildings, especially in public buildings and spaces. This theoretical approach to connect forestry, environmental science, and architecture is an asset to buildings of the twenty-first century. Kellert, Jeerwagen, and Mador's (2008) research within *Biophilic Design: The Theory, Science, and Practice of Bringing Buildings to Life* is a textbook staple in environmental design, civil engineering, and architecture courses. Kellert et al. argue that biophilic design is significant, and "a missing link in prevailing approaches to sustainable design" (p. 3). Thus, one goal of this thesis is to popularize these principles of biophilic design and to share them with the general public so that biophilic elements are better understood.

Living Future Institute (Living Building Challenge) Case Studies

This research has relied extensively on educational-type buildings, building means, and materials. Prior projects, based on natural ecological and preservation education, are utilized to help understand trends in sustainable design and the ways each are connected to the existing built environment. The following projects have been used to inspire the typology within this thesis. They are drawn from both The Living Building Institute's website—many of these designs available to use as templates towards a *ways and means* examination, and outside word-of-mouth examples. Simply, many of the more recent "Living Building" designs are available to study, especially because the LFI organization wishes to promote its philosophy. The following illustrated examples highlight the buildings locations, sustainable design criteria, and specification information. With these precedent-setting studies, the emphasis on biophilic design reflects each building's reciprocal connection to nature.

Omega Center for Sustainable Living, Rhinebeck, NY.

Year Completed: 2009. Location: Rhinebeck, NY. (Approx. 100 miles north of NYC) BNIM Architects

Project Plot: 4.5 acres

Building Area: 6,200 sf

Building Footprint: 6,200 sf

Highlights: Greywater and blackwater filtration, composting toilets, rainwater collection, potable water from a chemical-free rainwater filtration system.

Living transect: L3. Status: Certified "Living" Bioregion: Northeast: Typology: Building; Occupant Type: Business/Educational

Figure 4. Omega Design. 2009.
https://living-future.org/lbc/case-studies/omega-center-for-sustainable-living/

The Omega Center for Sustainable Living features Greyfield redevelopment land, which was used previously as a dumping ground for solid debris and buried by the owner. According to the Living Building Institute's website, the building harvests 16,476 gallons of water on site. It has a rainwater cistern with an 1,800 gallon storage capacity. Potable water is available from private wells on the property. Expended water is transferred through an *Eco Machine* before it passes back into the subsurface. The potable well-water system is tied into bathroom lavatories, a drinking fountain, janitorial sink, and wash sink. The facility has both greywater and blackwater processing fed into a system that recharges the groundwater. Rainwater is collected from the roof and is reserved for 100% non-potable use.

Ada and Archibald MacLeish Field Station (Bechtel Environmental Classroom at Smith College).

Year Built: 2012.

Location: Whately, MA Architect: Coldham & Hartman Architects

Building Footprint: 2,500 sf

Building: single story, wooden frame, classroom building – headquarters to 233 acre site

Living transect: L1 Living Building program version 2.0.

Certified Jan 2014

Status: Living

Figure 5. Exterior Perspective of the Bechtel Environmental Classroom.

The Bechtel Environmental Classroom, part of the overall outdoor lab for the Ada and Archibald MacLeish Field Station, was designed for Smith College in Northampton, MA by Coldham & Hartman Architects, a local firm. The classroom is the fifth Living Building created worldwide under the Living Building Challenge philosophy of (a) building with a net-zero impact (consumption), (b) materials certified to be free of endocrine disrupting carcinogens, and (c) having zero-carbon emissions over its lifetime (Massie, 2012). The environmental classroom is built on an overall land trust, part of a 233-acre nature preserve and meant for biology and earth sciences classes, seminars, as well as a community gathering space. There is a kitchenette, composting toilets, and a field manager's office. The original site was part of a grey-field and parking area with driveway (livingfuture.org). The original survey of the land trust and site selection for the classroom interpreted in its planning the protection of some of Northampton's municipal water supply because the lands are part of the watershed for the community (living-future.org).

Ada & Archibald MacLeish Field Station (Bechtel Environmental Classroom at Smith College).

Year Built: 2012.

Location: Whately, MA Architect: Coldham & Hartman Architects

Project Plot (Site Plan): 112,000 sf

Building Area: 2,500 sf

Building: single story, wooden frame, classroom building – headquarters to 233-acre site

Site Condition Prior to Building: Greyfield

Living Transect: L1 Living Building program version 2.0. Certified Jan 2014

Status: Living

Figure 6. Perspective view of Bechtel Environmental Classroom. http://www.smith.edu/news/gatenew/wp-content/uploads/2018/01/6D2C0203_1-copy.jpg

This building has an annual water use of 12,883 gallons, which was recorded in its first year of use (livingfuture.org). The greywater flow moves roughly 2,400 gals/yr. with 80% of that for irrigation. The greywater system is flushed into a septic tank and subsequently discharged to a leach field with four trenches and HDPE chambers (livingfuture.org). The Spring and Fall semester metrics used for water (except for the 5 week period of non-use during the months of December and January) are based on LEED data and Mass. Department of Environmental Protection (DEP) for sinks and hand basins (living-future.org).

Ada & Archibald MacLeish Field Station (Bechtel Environmental Classroom at Smith College).

Year Built: 2012.

Location: Whately, MA Architect: Coldham & Hartman Architects

Project Plot (Site Plan): 112,000 sf

Building Area: 2,500 sf,

Buidling: Single story, wooden frame, classroom building – headquarters to 233-acre site

Site Condition Prior to building: Greyfield

Living transect: L1 Living Building program version 2.0. Certified Jan 2014

Status: Living

Figure 7. View from Trail. Image source: http://www.smith.edu/news/gatenew/wp-content/uploads/2018/01/6D2C0692-2-copy.jpg

June Key Delta Community Center, Portland Oregon.

Year Built: 2012.

Location: Portland, Or: Nye Architects (on-going project)

Project Plot (Site Plan): 5,900 sf

Building Area: 2,005 sf

Highlights: Adaptive re-use, Solar Power, Bio-Swales, Rainwater Collection

Site Condition Prior to Building: Brownfield, Industrial site chemical contamination

Living transect: L5 Urban Living Building: site Redevelopment.

Status: Petal

Figure 8. Front Entrance. Image Courtesy: http://www.key-delta-living-building.com/sitebuildercontent/sitebuilderpictures/j.jpg

Figure 9. Solar Array currently installed on Delta House front Entrance. Retrieved from https://www.pacificpower.net/content/internet/pp/env/bsrecpf/cfr/jkdcc/_jcr_content_General_Content_cb_w_image.jpg/1387318757670.jpg.

Tyson Living Learning Center, Eureka, MS.

Year Built: 2008-09.

Location: Eureka, MI. Hellmuth + Bicknese Architects

Project Plot (Site Plan): 24,751 sf

Building Area: 2,968 sf

Building Footprint: 2,728 sf

Highlights: Solar power, greywater and blackwater filtration, composting toilets, rainwater collection, potable water from a chemical-free rainwater filtration system.

Living transect: L1.

Status: Certified Living

Figure 10. Design 2009. http://assets.inhabitat.com/wp-content/blogs.dir/1/files/2010/10/Certified-Living-Buildings-Tyson-Living-Learning-Center-2.jpg. The Tyson Center in Eureka, Missouri, part of Washington University.

Amory Lovins House. Old Snowmass, CO.

Year Built: 1984. Ongoing Renovations 2007-2009.

Location: Old Snowmass, CO.

Cost: $500,000

Project Plot (Site Plan): 5,000 sf

Building Footprint: 4,000 sf

Highlights: Passive solar power, active solar water heating, heat-mirror glazing, thermal retention trough wall

Construction: Superinsulation, setting.

Figure 11. Design 2009. Retrieved from
http://wiki.chssigma.com/images/9/91/Location_Lovins_Exterior.jpg.

The building was designed for a radiant temperature in the 80s of ˚F (~27–30˚C) and air temperature in the 60s (~17–19˚C)—healthier and more comfortable than air in the 70s (~21–22˚C). The sensation of human comfort is the average of air temperature and "mean" (averaged over all directions) radiant temperature (Shields, 2016).

Table 1. Combined Case Study Features (Usability towards Thesis Design Program Development)

Project Feasibility Towards Thesis's Design Template	Sq. Ft.	List of Functions	Key Usable Feature (1)	Usable Feature (2)
Omega Center (NY) Higher size range Sufficient volume for thesis' design of functional spaces. Resources for renewable space considered for mirroring into thesis' mechanical design features. Thesis' design fits this case study as template.	6,200	Living Laboratory or Classroom Bathrooms Auditorium Offices Commons Non-toxic materials	Greywater Rainwater Collection (Cistern 1800 Gallon Capacity)	Potable Water Filtration Photovoltaic Geo-thermal heating and cooling
Bechtel Environmental Classroom (MA) Slightly lower size range Adequate volume for functional spaces towards thesis's design as template. Overall spaces towards thesis's design as template and spatial arrangement	2,300	Living Laboratory/Classroom Office Bathrooms Commons	Greywater use for 80% of building use Non-toxic materials	For students as a Land Trust field station
June Key Delta Community (OR) Thesis' design does not fit this space as a template.	2,005	Office Bathroom Offices	Adaptive Re-use Solar Panels Non-toxic materials	Bio swales
Tyson Living Center (MO) Excellent match for spatial planning but not arrangement or layout Adequate volume for functional spaces towards thesis's design as template. Mechanical space pronounced.	2,968	Classroom Office Bathrooms Commons	Thermal Retention in materials Site Selection photovoltaic -23.1 kW Non-toxic materials	Passive Solar History as Native American quarry is interesting parallel to thesis' historical investigation also as a Native American utility.
Amory Lovins House (CO) Best size range. Slightly more than adequate volume for functions and mechanical space towards thesis's design as template	4,000	Offices Living Laboratory		

Summary

In summation, this chapter has reviewed the selected literature as resource and investigated the assessment of as-built elements through case studies. These findings are used to inform a design. Examples were chosen as best catalogued definitions towards the criteria of the building design being sought. Additionally this author has chosen to draw from these chronicles for specific direction of a sustainable type of building, presence of design intent of building, and a permeating spirit of place (*genius loci*) as they offer unique origins, scientific permeability, and cadence towards this paper's interests. Each example was carefully chosen to reflect the sequence of understood inspirations purposeful to the crux of this thesis. People also important to this paper, such as Kevin Lynch, Luna Leopold, Andrés Duany and Elizabeth Plater-Zyberk, offered philosophical insight and lexicons.

Chapter III: Programming and Analysis

Establishing Methods

The case in which to establish criteria towards a holistic community plan is certain to be met with challenges. At the physical juncture of Seneca Lake and Castle Creek, an impetus is needed in order to discuss and propagate important future decisions of how best to address the current problems regarding its watersheds. That is, an enterprise must predict and explain to the public some aspect of waters' calamities and there must be an urbanism criterion that acts in the public's best interest when its water is jeopardized. While communities such as Baltimore have a center for its Chesapeake Watershed Program (Chesapeake Bay Foundation, 2003), Geneva has no center of this magnitude that is open to the public at the creek's or stream's edge, specifically for public watershed education, and specific to that city's geomorphing. For the larger Finger Lakes watershed, the Oswego River/Finger Lakes Basin, there is currently no galvanized effort towards the ecological health of interpreting even one sub-watershed related to the whole macro-scale watershed. The effort of such an enormous breadth of responsibilities to groundwater and the basin, as the Chesapeake Bay Foundation has done, isn't available in Geneva. Yet water is everywhere around Geneva, just as it is in the small towns and villages along the Chesapeake. A universal design (accessibility for all) is needed with access to flowing groundwater and near a classroom. No space is currently being envisioned and juxtaposed at the creek's side to address sustainable education. The exceptions are educational interactive spaces highlighting biological *touch and feel* and some classroom laboratory spaces used field studies (i.e., the Finger Lakes Institute and

Seneca Lake Pure Waters Association) along the creek. However, these are usually not delineated well enough for the public to know what is occurring when no technicians are present. In this area, there is little to no interpretation or impression of scientific and academic purpose, other than what's conveyed in presentations, local newspaper articles, and in scientific research journals that can be difficult for the public to locate and comprehend. Therefore, the intent of this thesis is to design such an enterprise so that Castle Creek will be a household name synonymous with the Oswego River Basin. If those in the community wish to speak regarding how they feel about efforts to educate others, let there then be a greater discussion somewhere close to where they can hear the sound of a creek. The pedagogical impulse is to build at the best site possible and focus on leadership.

Project Goals

Place-making, as an urban design practice benefits communities looking to invest wisely in their economic futures. Riparian zone recovery, especially regarding revitalized creek and stream development, develops place-making spaces and enhances the quality of life in cities. New urban design trends are intertwined with progressive community landscape design (including water and daylighting treatments) and the proposed park and ecological center can be designed within these guidelines. The Finger Lakes region needs a building that stays nearby as well as conveys its product scope. The building must have a presence and magnitude that is far-reaching, in order to inspire small creek vitality, preservation, zoned revitalization, urban economic, and physical landscape resiliency (especially after floods).

I offer a conceptual design and hopeful catalyst, the *Center for Urban Ecological Dialectics* (CUED), to be located somewhere on the banks of Castle Creek and where it can address modern needs, not just for the city of Geneva, but the needs of all cities. This center, for the sake of establishing a template for 13,000 people, is to be designed around all that Geneva has to offer: recreation, food, water, sustainable design, debate, stories, established friendships, and new relationships to be created. An alternate name and earlier concept drew inspiration from an archaic dam and sawmill, once on the opposite bank from the chosen site for this design. Thus, an homage to “Mill” Street was made and the *Mill Street Waterworks* (MSW) was one possible name. The CUED naming helps define an earth science emphasis over MSW’s nomenclature of novelty. The resultant project, once built, shall be a public use pavilion with programs designed to encourage the community, of all ages, to pursue greater ecological participation. Because of the decreasing lake quality, this cooperative, consisting of kindergarten–college participants, colleges, and universities, offers as its mission a way to better foster the publics’ perception of Castle Creek. It’s aim is to help bridge the divide over current wastewater habitualization and strive towards resilient and optimal use along the creek. One such focus towards this shall be a program of permaculture and food. Furthermore, the building is meant to validate its own authenticity by allowing community members an opportunity to survey their own ecological footprint as an urban ecological practice designed towards supporting better household habits. Programs such as structural rainwater collection and household checklists (that address good practices) as well as educational resources and sessions will be offered to community members. These will assist in monitoring behavior to establish sustainable criteria. The watershed may potentially be better understood, throughout the entire community, as one of Seneca Lake’s cleanest sub-watersheds, as a direct result of future progressive self-regulation.

Each neighborhood will establish clean watershed goals through progressive neighborhood initiatives. The program's success will be attributed through public outreach, within its own collaboration. The Living Future Institute criteria will also assist in this endeavor.

Geneva's building shall be a benchmark for both sustainable design and LFI's living building design. The Center for Urban Ecological Dialectics will incorporate the already vital relationship of environmental stewardship and research partnerships between the City of Geneva, the Finger Lakes Institute (FLI), Seneca Lake Pure Waters Association (SLPWA), and the Finger Lakes Community College (FLCC). Supporting the developments and accomplishments of these organizations, respective faculty, participating K–college students, and volunteers, the program will foster an overall awareness of the urban creek as a much greater feature than previously realized solely because the building design will be permanently grafted to the creek. A public financial supporter of CUED might further support an agency, perhaps such as an SLPWA, a primary advocacy group for water quality on Seneca Lake. The Finger Lakes Land Trust, in Ithaca, New York, is also being considered for future phased-in development of CUED zones along Castle Creek. That would entail placing the creek into a drafted public land trust, enriching partnerships publically and further defining potentially restored natural spaces through easements and land grants.

CUED is to be constructed as a Living Building Challenge design, after extensive consideration of specific case studies from the International Living Futures Institute (ILFI), a highly rigorous stepped program in green/environmentally aware construction that emphasizes localization and economic vitality. This process is considered paramount towards CUED's strategized system, economic balance, with an intensive ecological theoretical foundation. The choice of a LFI's approach and influence also overlaps the guidelines set up by the US Green Building Council (USGBC). CUED is to be designed with equally stringent standards as a LEED Platinum design. Using both LEED Platinum and LFI's programs provides an excellent template towards carbon neutrality, environmental education, green space, and user-inspired programming. Thus, local students will be utilizing CUED's garden space along Castle Creek to establish native plant species and edible permaculture design. Students will have the opportunity to be guided on field studies upstream to catch and release subject matter for biological study. An attitude of science combined with recreation will be synchronized towards the creek within CUED. Annual cleanup efforts designed to remove household debris and litter will be initially necessary but hopefully will be needed less over time, a direct result of CUED. CUED will become a zero waste facility and food waste will be composted. CUED's project goals are:

1) Promote sustainability within and surrounding the proposed public site design.
2) Determine the efficacy and feasibility use for both available geothermal amenities for use throughout the building's normal activities.
3) Understand potential flow energies produced by surges in the creek especially by flash events from heavy rainfall during super storms vs. typical seasonal weather patterns.
4) Study water quality from the perspective of local hydrologists, biologists, across the south, west, and north branches of the creek, in the towns of Seneca and Geneva.

5) To clear woody debris and to generate new visual nodes and points of interests along important sections of the creek.
6) To maintain views and access to the creek for all users
7) Promote mobility for those with physical disabilities through both the site and building design, and connect to circulation modes created for disability assisted users.
8) Draw the attention of the local community to sustainability and creek-centered activities, such that activities are considered an integral sport-science that mimics nature such as in fly-fishing or bird watching.

CUED will offer classes on sustainability education, but also promote voluntary and spontaneous learning programs. The building shall be visually attractive and inviting as a masonry style building, resembling several of Geneva's structures for higher learning. A cottage-lodge style shall be incorporated. The place will bring together geoscientists, biologists, and the next generation of hikers, explorers, and wildlife experts. Additionally, this will support and deepen the spirit of local wildlife conservationism around the Finger Lakes streams for regional bug collectors, hikers, geocachers, birdwatchers, and small stream anglers.

The CUED program will be successful through the procurement of a land trust should the city enter into this relationship, or with a collection of individual parcels annexed, allowing for subsequent recreational space and watershed education. This will be a regional attribute and could also co-opt with NYDEC (New York State Department of Environmental Conservation) for ecological revitalization zoning.

Project Inspiration

The means in which to facilitate CUED are exclusively related to its being a highly specific and sustainable design while aiming to give back more than what it takes from the space. Because of this, the CUED author's visitations of buildings draws inspiration from such spaces as the Awhanee Lodge in Yosemite. This is one example of what is meant when something becomes what it represents, an environmentally sound vision for the future of natural resource protection. The materials and all physical and indirect work (energy) must fulfill a reasonable goal. As Buckminster Fuller (1961) once said, "[making] the world work for 100% of humanity in the shortest possible time through spontaneous cooperation without ecological offense or the disadvantage of anyone" (www.bfi.org., 2017). Inspiration for 100% involves a lot of research.

Project Vision

Not only can CUED provide a foundation for helping understand creek-sourced products as per the creation of sustainable strategy, but it can also borrow techniques from other lake watersheds or provide feedback to them. A fundamental aspect of CUED is about a community that shares information—especially when it benefits local ecological pedagogy. CUED shall be known as one portal in many worldwide retreats for water interaction. But being a beacon for keeping the water clean and pure won't only be the focus. The building's interactions will hopefully be seen as a progressive dialectic and philosophical tenet within the place and across the landscape. It is hoped that the curricula envisioned for CUED will gain renown such as seen with the Chesapeake Bay Foundation, Riverkeeper Alliance, Sierra Club, and Greenpeace. The simple goal of CUED is to grow and inspire more CUED's worldwide as the behavioral programs developed here will inspire eco-scholarship and grassroots environmentalism, as this author has seen and participated in with fellow Genevans. The vision of one roof over a fellowship of environmental stewards is the essence of CUED and new recruits from the newly dubbed neighborhood zones, in Geneva, shall make up the collective, or commonwealth approach (to CUED). The programs offered by such a place will inspire others to get involved and volunteer to maintain the creek and thereby nurture the watershed. Those who enter as strangers will quickly be absorbed as friends. CUED is central to the city and there should never be a city resident who doesn't pass through its doors at least once.

Project Social Considerations

This thesis culminates several years of trial writings and concentric arguments upon which dimensional adjustments for re-configuring social spaces have been explored. This thesis is also meant as a design guideline informing the masses. A proposed community-centered classroom and public-use pavilion, somewhere along Castle Creek in Geneva, New York, is paramount within the overall Creek trust. It is envisioned as being selective towards an efficient, supportive, sociologically valid, and sustainable design solution serving the creek. CUED distinctively characterizes itself as a progressive foundation in terms of its programmatic means, functionality, and deliverability. CUED shall be attentive towards its means and mode within Geneva's ecological mosaic. The holistic design approach shall encourage physical determinism and philosophically sensible energy use. While the development of restoration work and cultural preservation are earmarked for the mouth of the creek at Seneca Lake (Lakefront Park), a mid-station along the entire path must be built to ensure that a similar spirit of urbanism spawns up-creek. The creek environment shall influence neighborhood support through promoting activity surrounding this urban eco-module. The Center for Urban Ecological Dialectics (CUED) shall prime a new social code for tomorrow's learners and environmental leaders. The CUED's architectural foundations (as goals) are grounded in bettering the city by allowing users to see the forces at play in nature while choosing to go further or simply admiring the splendor of this park setting. The park setting can still grow further. Herein is a pedagogical consideration. However, there are many sites along the creek in which to envision a structure that will be the domain for this pedagogy. Two sites are very close to each other and in the heart of the city, coinciding with the most active parts of the creek. These two sites are the central contemplation of this thesis.

Project Environmentalism

Re-examining the cultural significance of the creek—physical environment, biological environment, and setting—appropriates the goals of this thesis. An environmental facility must prioritize a synthesis between the built environment (household and human needs) and water education. Rethinking methods and understanding basic natural settings along with the communicative goals of any past design process lend themselves to envisioning the new processes of urbanism in Geneva, NY. Integrating concerns from other past historiographical intervals belays the knowledge concerned with ecosystems, alleviating hardships especially inherent when failed systems were incapable of supporting human welfare and public health. Local threats to poor water quality and neglect of otherwise usable space in the city must be part of the ecological center's assessment and learning rubric. CUED will be that, as it operates under these principles and fosters the philosophical precept that will make residents of Geneva more aware of its assets. Whatever projects threaten water should be left behind and those that preserve water quality should be embraced and written into laws.

A challenge exists. This project seeks to push us into confronting the institution of our constructive means and exploring the philosophical embodiment of well-practiced manufactured and methodological systems (foregoing conventions of us as an in-place capitalist economy, using fossil fuels and harmful chemicals). Advocating for environmentally sensitive attitudes, activism, community participation, and an ecological focus is philosophically the primary purpose of this thesis. As Geneva reconnects to its natural setting, future generations will understand the idea of what's happening at the creek, a primordial connection to Geneva's past natural ways. It is hoped that as the creek becomes a conduit, a trail within itself will appear. This trail, unto itself, becomes the local medium for small hikes and explorations; the automobile is left at home and a walk to Ed-Din's "Glen" is unveiled.

The Center for Urban Ecological Dialectic's project environmental mission is to educate the community on ecological issues in the city. With the CUED mission of fostering awareness locally, it will develop standards that will help, compliment, and support the project's goals for years to come. The CUED will restore faith and appreciation around the creek community and help develop compassionate learning that may occur during a locally prepared farm-to-table meal, while simultaneously examining future obstacles to creek preservation in the city. Furthermore, the integration of a sustainably designed building, as a central space, reflecting the core values of Castle Creek, will become an urban design template; an environmental mind map.

Methods In Surveying For Public Consensus

As a means to better understand the needs for developing a center focusing on watershed education in the community, a convenience sample survey was conducted to help evaluate the public's perception of the creek. Methods included *cold calling* one resident, while other participants were solicited by chance meetings. This author represented himself to each of the creekside resident(s) as a Graduate Student of Architecture from Rochester Institute of Technology, working on a thesis. All who were asked were both very interested in this topic and in participating in the study. There were 23 participants between the ages of 18 – 65, 16 were female and 17 were male. Nineteen of the 23 participants are represented in (Figures 24–29).

The survey sought both qualitative and quantitative information surrounding the immediate locality of an envisioned building designs, at two locations. On April 1, 2015, April 18, 2015, Oct 2016, and finally March 2017, this author personally conducted random surveys with sixteen households at different locations along the Creek. The survey provided meaningful information and provided better insight regarding the individual residents attitudes about the creek. Two questions were asked to the sixteen households with 23 full-time residents partially or totally represented in this research. In question one, residents were asked for their assessment of creek quality and question two asked about their acceptance of a potential ecological center. The first question was: "What is your opinion of the environmental quality of the creek during your time spent living next to it?" The follow-up question was: "What is your attitude towards the enhancement of the creek and a pathway system, as well as a permanently built ecological center, focused on creek preservation?" The responses, addressed in the next section, collectively agreed that Castle Creek suffers from neglect and that the symptoms of this are seen as (a) the presence of trash and (b) vagrant teenagers "hiding out" and engaging in delinquent activities. One resident had suspicions that such a facility could be noisy and bring more “menacing” teenagers into the area. Table 2 illustrates qualitative responses according to four residents surveyed. While some residents chose to provide qualitative information, in the form of personal comments, the general survey was conducted with participants answering questions on a 1–10 gradient for a more quantitative method. This approach was especially helpful in developing key results towards a frequency platform. The information from these surveys could be used to help develop proposed lectures, forums, and discussions about the Creek watershed quality and the establishment of an ecological center for Castle Creek.

A Survey Of Local Residents On Castle Creek

While addressing public sentiment towards Castle Creek environs, this author chose to examine psychological aspects from a selection of residents surveyed. The purpose of this was to determine a design at either a new location or within a different already built location along the creek. Residents gave personal comments and seemed collectively passive, but were also respectful of the creek’s prevalence and historic value as a resource in the community. That is to say, they were aware that water flows through the city to the lake, however, they also acknowledged that other parts of the city have received greater attention than the creek had. For example, Judy and Joe Jacobs, at 40 Brook Street, having lived at this address for forty years, mentioned that they has found people down near the creek and occasionally had found used hypodermic needles from drug users. Joe likes the creek but is concerned that the neighborhood is transitioning “for the worse.” He was not the only one who stated this as the resident at 86 Mill Street also mentioned seeing illicit drug use (in one location along the creek being considered for the design site). When this author pressed further about an ecological center and pedestrian control near his house, at first Mr. Jacobs seemed ambivalent about it. However, he was able to appreciate what was described to him as a safer, better-utilized park, and a route for police to travel on, via mountain bikes. He liked this idea a lot and has long been vigilant about debris and the behavior of youths along the creek.

A question was asked about a possible construction project in the park, with the city as the developer, on property owned by the city and near the creek. Anne Hoyt, who has lived at 667 Castle Street for several decades, was surveyed during a stroll along Castle Street. She was largely in favor of this design concept as the creek is in her backyard, although far from the Brook Street Park. Another resident, who's only lived at 56 West Street for two years was also largely in favor and stated that he felt the city should, at the very least, clean up the scrub brush and let the creek be more day-lit and visible from his backyard. When asked if he minded if there might be a pathway for a regular flow of people walking on a trail or sitting on benches, at least 30 feet beyond his yard, he said, "he wouldn't mind as long as people used the creek responsibly and kept the park clean." Currently, he sees trash floating in the creek, especially when the trees are bare.

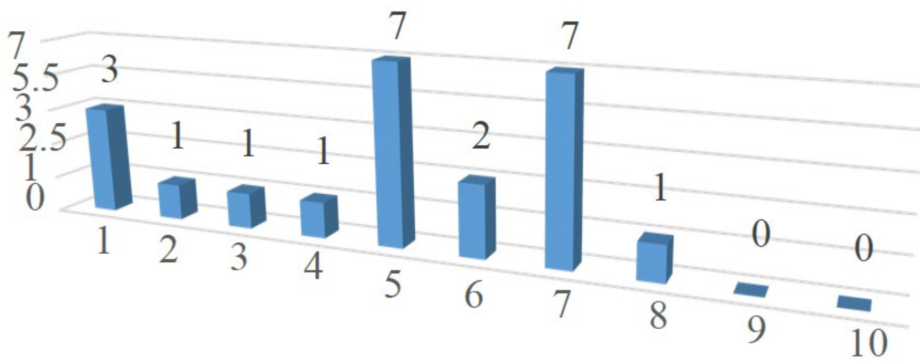
A survey conducted between 2015-2017 was used to help develop a program for CUED. The following charts and tables represent the metrics associated with surveying a section of the population near the creek, Table 2 represents a cross section of the overall sample set and specifically it offers qualitative information based on opinion resultant feedback. It primarily represents permanent residents who have lived in their households for extended durations who were willing to offer their insight on a proposed ecological center. Participants were willing to have their opinions published for this research paper.

Table 2
Convenience Sample Survey: Castle Heights and Hildreth Hill Neighborhoods

Sample Resident	Years at Residence	Proximity to proposed CUED Site #1	Opinion of CUED	Results
Resident 1	20	.75 miles	Speaking on behalf of self/spouse, they love the creek and have created a path to it from their home.	Thinks a nature center would be a valuable resource and bring neighborhoods closer.
Resident 2	2	.10 miles	Wish the scrub brush and thicket on [resident's] embankment was maintained by city. Would like to see park extended along the creek, with benches	Thinks a nature center would be help bring people to the creek for more enjoyment. Wouldn't mind that they would be close to property.
Resident 3	40	.10 miles	They annually maintain creek embankment, clearing brush, always maintain large lawn owned by city. Enjoy the creek but have seen trouble from kids.	Was apprehensive about a pathway idea but liked the concept of a nature center for the community. Especially liked the fact that space is maintained.
Resident 4	22	.19 miles	Big advocate for outdoor recreation and lifelong resident. Grew up playing around creek and hiking along it for many miles.	Likes idea of youth interaction programs with nature studies especially because he has kids. Has seen delinquent teenagers disrespecting it.

Question #1 (Figure 24) of the survey examined how 23 residents evaluated the environmental quality of Castle Creek. 13 of the participants surveyed answered at value of 5 or below while the remaining 10 participants surveyed answered above the value of 5.

Question #1: On a scale from 1-10 (10 is the highest quality and 1 is the lowest)



Quality Rating

Figure 24. Convenience Sample Survey of local creek side residents in Castle Heights and Hildreth Hill Neighborhoods of Geneva, NY – Conducted Sep. 2015 – Mar. 2017. Bar Chart for Question 1 “Quality Rating” (23 Individuals Surveyed).

Question #2 (Figure 25) asked 23 participants: On a scale from 1-10 (1 being "no interest"; 10 being of "High interest") how interested would you be in seeing a community ecological center to be built at Brook Street Park along Castle Creek? 16 participants questioned answered above the value of 5, while only 7 participant answered at, and below, the value of 5. This revealed that more than half of those surveyed are enthusiastic for a potential eco building in their neighborhood.

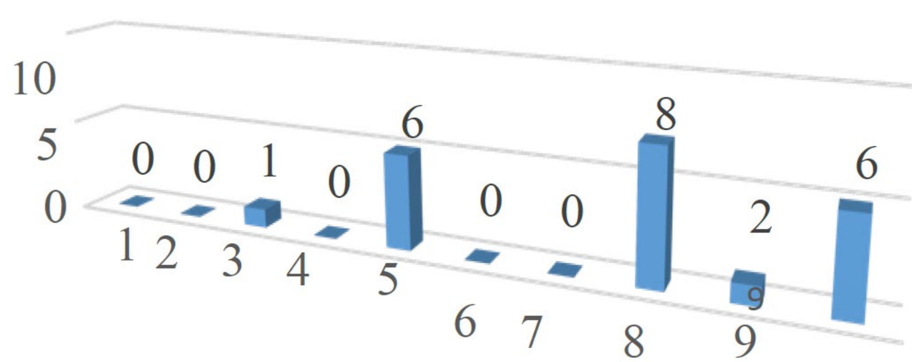


Figure 25. Convenience Sample Survey of local creek side residents in Castle Heights and Hildreth Hill Neighborhoods of Geneva, - Conducted Sep. 2015 – Mar. 2017. Bar Chart for Question 2 “Quality Rating” (23 residents Surveyed).

Question #3 (Figure 26) asked: "Do you think there is a need for a non-profit group that provides education, preservation, and better awareness regarding Castle Creek?"

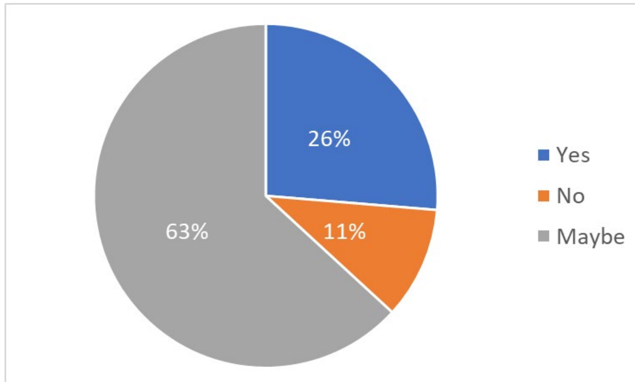


Figure 26. Convenience Sample Survey of local creek side residents in Castle Heights and Hildreth Hill Neighborhoods of Geneva, NY – Conducted Sep. 2015 – Mar. 2017 - Pie Chart for Questions. 3 "Percentages" (19 residents surveyed).

In Question #3 (Figure 26), these percentages are represented as pie charts. 63% of the participants questioned indicated a maybe, while 26% said yes. 11% said no. Question #4 (Figure 27), participants are asked about possible recruitment to become a local ambassador for CUED and to define potential participation and a willingness to volunteer. Of 19 participants surveyed, 37% indicated they were interested, 37% indicated they were not, while 26% indicated maybe.

Question #4: If a community ecological center were to be built at Brook Street Park in the future, would you be interested in becoming involved in training and education about important aspects of caring for the creek?

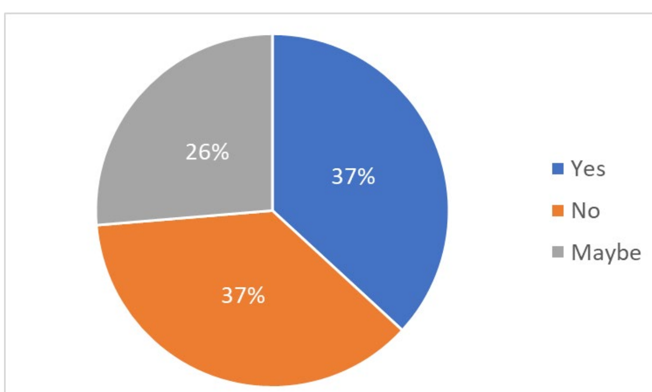
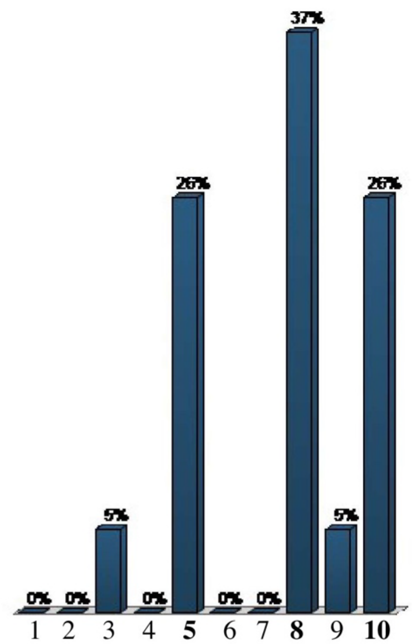


Figure 27. Convenience Sample Survey of local creek side residents in Castle Heights and Hildreth Hill Neighborhoods of Geneva, NY – Conducted Sep. 2015 – Mar. 2017 - Pie Chart for Questions. 4 "Percentages" (19 residents surveyed).

Figure 28 (below) data represents weighted values for question #2 for 19 participants surveyed.

2. On a scale from 1-10 (1 being of "no interest"; 10 being of "high interest") how interested would you be in seeing a community ecological center to be built at Brook Street Park along Castle Creek? (Priority Ranking)

	Responses	
	Percent	Weighted Count
1	0%	0
2	0%	0
3	5.26%	1
4	0%	0
5	26.32%	5
6	0%	0
7	0%	0
8	36.84%	7
9	5.26%	1
10	26.32%	5
Totals	**100%**	**19**



Question Statistics	
Mean	7.53
Median	8.00
Variance	4.57
Standard Deviation	2.14

Difficulty & Discrimination	
Mean Score of Correct	NA
Mean Score of Incorrect	NA
Standard Deviation of Scores	NA
Difficulty Index	NA
Discrimination Index	NA

Figure 28. Convenience Sample Survey of local creek side residents in Castle Heights and Hildreth Hill Neighborhoods of Geneva, NY – conducted Sep. 2015 – Mar. 2017 – Weighted Results Question #2. (19 residents surveyed)

The purpose of the different convenience sample survey question types served to understand different household perspectives of this authors' development criteria surrounding Castle Creek as a site for CUED. Of the respective 19 or 23 participants questioned, a valued percentage has been represented. For example, in figure 29, the comparison utilized examines the third and fourth questions, shown side by side. The comparative analysis of question #3 versus question #4, shows 63% of those surveyed largely favor a non-profit entity that would oversee the preservation of the creek. Interestingly, in question #4 over one third of those questions showed an interest in volunteering for such an agency and being involved in creek preservation.

	Third Question		Fourth Question	
	Percent	Count	Percent	Count
Yes	63.16%	12	36.84%	7
No	10.53%	2	36.84%	7
Maybe	26.32%	5	26.32%	5
Totals	100%	19	100%	19

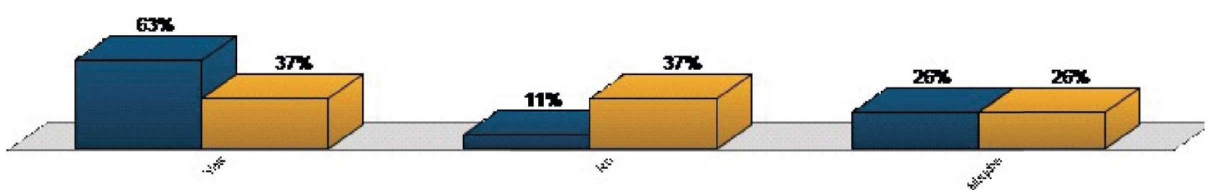


Figure 29. Convenience Sample Survey of local creek side residents in Castle Heights and Hildreth Hill Neighborhoods of Geneva, NY – conducted Sep. 2015 – Mar. 2017. – Weighted Results Ques. No 3 and 4. (19 residents surveyed)

In conclusion, the convenience sample survey helped interpret the public's perception, which assumedly was a somewhat vague awareness of the creek. It also helped to identify user attitudes amongst the Hildreth Hills and Castle Height residential districts towards a site selection. Information through the survey was used to help define the CUED as a resource to the community and a potential center of excellence concentric to all 12 unique zones of the city. Using the survey as a demographic study, the information assisted in the program's conceptualiztion by acknowledging and utilizing the neighborhood opinions in the design process, The functionality of CUED was based on conversations with people who felt an ecology center, surrounding the creek environment, would be something both acceptable and purposeful. While several people felt that the creek had been neglected, they also saw it as an attribute worth protecting.

Contextualization

As an accompaniment within the urban fabric, contextual studies will take root in a determined plot amongst Geneva's dense residential district, or in a constituted recreational space. The chosen site shall further facilitate a greater use in the overall established schematic design. The opinions of some neighbors suggest that something better could be done with one such parcel of land under consideration. This intrinsic establishment of an integrated building focuses on how perceptual understanding of a perennial creek can be better understood socially, within a city. The context for the two potential sites on the creek will be explored separately as the understanding of each addresses the building's feasibility as per the creek. The physical current of the creek, as a natural resource, works towards protecting the zone around Castle Creek. The successful building will be selected based on an appropriate site and will work as an urban planning tool, because it is plugged in to the adjacent neighborhoods, and is dependent upon the social context of each. The successful building will provide a center that is an ecologically balanced to the needs of the urban context. The residences adjacent to this building are situated close together and are century-old two-story "street front porch" style homes. They are at the east and south perimeters of the two considered sites, on top of a sloping grade to the creek. These houses are made from timber frame stock and as a compliment to these homes, the successful building design could be a blend of craftsman style or mid-century modern that provides a residential scale, warmth, character, and charm to the already warm characteristic of the neighborhood while providing minimal impact as the site would not be visually disruptive, contextually.

Partnership For A Future Carbon-Offset Pattern

Municipal environments are increasingly changing and facing yearly, even monthly challenges both locally and globally. Sea-level rise, receding Arctic ice-shields, and more frequent super-storms are increasingly threaten our communities. Additionally, acid rain, global warming, ozone depletion, and significant CO_2 emissions contribute to poor air quality in both rural regions and cities. Constraints of the as-built environment have not lent themselves as sustainable designs. Over the past few decades' new construction projects have made strides to address these environmental concerns. Currently, the next generation of architects are building with programs that better both their designs and the world around them. The U.S. Green Building Council's LEED Green Building Institute program and the criteria of the Living Building Futures Institute are just two of several philosophies upon which this thesis focuses.

Geneva, New York's two major universities: Hobart and William Smith Colleges and a portion of the Cornell University AgriTech Campus are among many nationally ranked institutions dedicated towards net-neutrality and carbon reduction initiatives. Geneva is one of few cities of its size in the United States that can be identified as bringing in alternative power resources within its industrial zone boundaries and co-opted for energy consumption, for the greater common use of its inhabitants. They have done so by giving back to the grid and working towards exactly this challenge—an initiative originally envisioned in the 2030 Challenge, established in 2002, by New Mexico architect Ed Mazria (architecture2030.org, 2017). In fact, in 2009, Geneva's Zotos Corporation took steps to meet this challenge. Zotos, a Japanese based cosmetics and beauty manufacturing company with a large manufacturing plant in Geneva recently installed two Hyundai 1.7 megawatt wind turbines in the city's industrial zone. According to data from the website, Open Energy Information, which is maintained by the National Renewable Resource Laboratory, these turbines have a generating capacity of 3.3 Megawatts annually (en.openei.org/wiki/Zotos). This partnership through the Geneva Industrial Development and a private company, in a zoned park, has illustrated a progression towards sustainability. The city's awareness of renewables has shown its desire to co-opt with Green private investors especially as an eco-alternative economic incentive in the Finger Lakes. Because the dual wind turbines at the north end of the lake can run in tandem, generating more than the desired kilowatts needed for the 670,000 SF facility, these 370' tall turbines can also produce 5% of the power for Geneva's annual needs (Zotos.com, 2014). Offsite renewable energy is at the forefront of CUED's goals.

Preservation

The city of Geneva is an enormous showcase of historic preservation. In April 2015, the city hosted the Landmark Society of Western New York's statewide conference on preservation. Morning forums and several break out sessions departed on walking tours, exploring the city's many facets of interest to this preservationist league. Colonial, Dutch, American, and Victorian styles are represented in Geneva and historic Greek-Revivals, Federal type row-houses, and Georgians are typically part of the historic district zoning. This thesis' design adheres to preservation guidelines and upholds city characteristics towards the type and scale of a new building.

Ecological Education Programs

CUED is a proposed ancillary community classroom that will serve existing ecological networks and city partnerships in fostering educational programs specifically at Castle Creek. This classroom/laboratory, at the creek's edge, is as an as-built design, making it unique from its other classroom/laboratory partners who are much further away from the water. This better proximity will also address the needs of smaller recreational use such as fly-fishing and shrimp-trapping. Increased education regarding biological applications shall be made available as per available treks, up Castle Creek to the training waters, within the city.

Community

Architecture plays a privileged and invaluable function within a community. It is dialectical and an expression of individualism. It has a particularly special meaning and is pertinent in Geneva because of the city's overall strong attitude towards preservation. The Center for Urban Ecological Dialectics will serve the Geneva community through sustainable design practiced with characteristics of traditional vernacular and architectural styles found regionally. The CUED shall benefit the city in an equitable way and add additional green space with a 1:1 ratio of the area occupied. It shall also contribute community access with "how-to" programs for local city schools, seniors, disabled, and people of other challenges, offering provisions to the community's many assistive and inclusive programs. The design of the CUED shall offer sufficient, interior functional space for occupants based on all of these criteria. A pavilion with an accessible veranda is a significant feature that will allow all users to have the creek in their view plane, as a contemplative space and to see the terraced grounds with gardens. An optimal design program shall incorporate a secure front entrance, classroom and instruction area, small conference space, equipment storage, locker rooms, and a field office. Support spaces include bathrooms, storage, and mechanical space. All spaces will be freely accessible and have comfortable circulation. Community precedent studies based specifically on working with the city of Geneva—in discussions with the buildings code enforcement officer; Neal Braman; as well as the Interim City Manager, Sage Gerling – are important to the designed space because they are embedded in planning and management. The Geneva Neighborhood Center (GNRC) has also been implementing community structure and has successfully created districted neighborhoods, as shown in the city's final version of the 2016 map (Figure 53). While the importance of these neighborhoods is evident from a planning perspective, the future definitions of community characteristics may help define CUED in its location between Hildreth Hill and Castle Heights.

Community Feedback

Previous surveys of local residents tracked a general consensus toward a community ecological center, which included several specifically designed questions that an architectural review board committee might pose. In 2016, Denise Parks, a nearby resident at 35 Brook Street responded to the standard design inquiry. Ms. Parks, who sits on the planning review board for the city and is closest in proximity to the CUED, assisted in this paper by raising the following questions regarding a potential program for the building. These are, per her response:

1. What will the park lose in order to build this structure?
2. Where exactly would it go?
3. Who would be paying for the design, construction, upkeep, of said facility?
4. Will the structure belong to the city or (will it be) privately owned?
5. Will it interfere with lawn maintenance of the park and will additional structures mean additional maintenance costs?
6. Who will be responsible for maintenance repairs (work and costs)?
7. Have you approached the Neighborhood Association, the Public Art Committee, and the City Council with this proposal? (Parks, 2016)

The Six S's

Sustainability must always be intensely integrated into architecture built today. It has to be considered during the early proposal, schematic design phases, and programming. Using a popular breakdown method and criteria applied to the CUED design, this research relies on the proverbial "Six S's" of a building, as borrowed from Stewart Brand's (1994) *How Buildings Learn: What Happens After They're Built*. In this book (also a TV series) Brand deals with the cause and effect of how buildings degrade over time. However, an article in the *Environmental & Architectural Phenomenology Newsletter* mentions that Brand originally borrowed this concept from architectural historian F. Duffy's 4-S approach of capital investments in buildings (Childress, 1994). The six S's entail (a) site, (b) structure, (c) skin, (d) services, (e) spaces, and (f) stuff and are as Childress (1994) notes, the "Hierarchy of Pieces." We adapt this to CUED by examining what Childress notes in his review regarding each of the six S's as outlined in Brand's (1994) chapter "Shearing Layers" in *How Building's Learn*. Childress paraphrases Brand's writing

> The ***Site*** is eternal; the ***Structure*** is good for 30 to 300 years ("but few buildings make it past 60, for other reasons"); the ***Skin*** now changes every 15 to 20 years due to both weathering and fashion; the ***Se*****rvices** (wiring, plumbing, kitchen appliances, heating and cooling) change every seven to 15 years, perhaps faster in more technological settings; ***Space*** Planning, the interior partitioning and pedestrian flow, changes every two or three years in offices and lasts perhaps 30 years in the most stable homes; and the innermost layers of ***Stuff*** (furnishings) change continually. (Childress, 1994, web)

Space Needs

This section will cover various analyses, feasibility studies, and spatial programming for CUED and will examine two individual site locations to possibly integrate a building, based on survey analyses from the previous chapter. It will address studies towards understanding bioclimatic zones and microclimates and include the degress of sunlight and shade at the site, effectively determining the latent thermal effects within the building's materials conductivity and emissivity. This section presents a detailed program in which to develop a design and place respective compatible components into a building. The vocabulary for this section is defined by conditions in the programming and are related to the following terms.

General Requirements: Fire and Safety Egress

Parking Additions and Alterations. Full parking will be adapted from an existing 16 car lot. Access points and building access for fire equipment will be provided.

Handicap Accessibility. ADA compliant access will be provided to allow for handicap accessibility throughout the building and on the grounds, over the pedestrian bridge, and connecting to the existing path on the north side (previously designed by in-Site Architecture, in 2011). The main ramp of 1:12 grade over 30' will be provided to the entrance from the parking area. Two ADA parking spaces are to be provided by the ramp.

Site Plan. A comprehensive site plan is to be created and shall display all schemas of the spatial interactions for the proposed users of the community ecological center. The site plan will also show potential usage of groups and interactive advantages for this, by user demand.

Storage Room. Storage for bicycles, equipment in the community center.

Community Room. A 900 sq. ft. community room (the "Outdoor Room") will be designed for a maximum of 26 people as this will be provided as a public meeting and event space.

Kitchen. An adequate kitchen is to be integrated into the building to serve both the outdoor room, commons space, and fireside room. The kitchen will offer energy efficient amenities in refrigeration and an electrical oven magnetic induction cooktop.

Laboratory. A learning laboratory space will be fully integrated into the floor plan so that students can directly assess water samples from the creek.

Public Restrooms. All 3 ADA restrooms are positioned with equal accessibility to all common functions in the building.

Office. A 200 sq. ft. office will offer space for administrators.

Public Art / Interpretive Signage. Plaques and embedded relief sculpture, with inscriptions in print, will help form interpretive signage. Local sculptors shall be used to depict history within the edifice and especially throughout the proposed veranda space on the building's exterior. These displays shall depict the history of Castle Creek and Brook Street Park. The Geneva Historical Society and the Public Art Committee will contribute to this.

Mechanical Space. Sufficient provisions shall be made within the basement/crawl space and in the upper rafter spaces for suspending ductwork and for securing equipment in the mechanical tower platforms.

Electrical Systems. Outdoor and internal lighting shall be provided to actively illuminate all spaces. Electrical conduit shall be diligently laid and accordingly linked to existing electrical utilities. Electrical wiring related to solar power stored energy will be separate from other conduits.

HVAC System. Ancillary HVAC systems are to be provided when geothermal heating and cooling can not provide sufficient room temperature and comfort level.

Proposal for Best Space

Based off of the precedent studies analysis shown in the summary of spaces (Chapter 2, Table 1), the spatial needs used as the summary from the Chapter 2 exercise helped determine that the most suitable template is, in fact, the Bechtel Environmental Classroom. The 2,300 sq. ft. facility, although small spatially, functions and serves as the best template in the pre-programming and feasibility study. The summary of space for this particular building is represented in a colorized zone plan, shown in Figure 32. This process of examination serves as a baseline to assist in developing guidelines for the final spatial programming. As per Bechtel's 2,300 SF, The CUED building ultimately requires over 2,700 SF.

Site Selection

Location – Potential Sites

Geneva, New York, is the location for this proposed project. While it is in a rural area, Geneva is considered a small city with a diverse population and a densely populated district surrounding its downtown. The Center for Urban Ecological Dialectics will be located at one of two considered locations in Geneva. The first proposed site is adjacent to Castle Creek and is dubbed "the Urban Forest (Site #1)", and resides within Brook Street Park. The other considered site, simply called "the Adaptive Re-Use" (Site #2), which potentially would have a central focus in a former supermarket, is on a bridged concrete structured site over the creek. In both cases the CUED will be located approximately 1-mile south of the High School/Middle School, 3/4 mile from the Cornell University State Agricultural Experiment Station, 2/3 mile from Hobart and William Smith Colleges, 2/3 mile from the North Street Elementary School, 1/2 mile from Finger Lakes Community College, 1/3 mile from St. Francis de Sales and St. Stephens School, and 1/4 mile from West Street Elementary School. Thus as evidenced, the site provides a centralized location for student opportunities. Its focus of creek preservation will be directly juxtaposed to the creek and its visual connection will be a key interplay. The sights and sounds, organic smells near the creek, and the rush of soothing water will hopefully administer the partial biophilia, supplemental to better understanding the creek from many physical senses. The two considered sites, however, differ in regards to the natural settings one might perceive for a CUED on a creek. Table 3 identifies spatial needs and these will help determine a form and proper site selection for CUED. The information is obtained using a programming worksheet.

Table 3. Building Code/Spatial Planning Chart (Circulation/Egress).

Room	Qty (people)	SF/Occupant	Sq.Ft./Required	Gross Sq.Ft/Proposed
Main Entry Vestibule	2	30	60	120
Library Storage Closet	48 (items)	1/item	48	70
Library	5.5	30	160	169
Veranda Circulation	200	10	2000	1984
Commons Area Main	8.333	30	250	250
Commons Fireside Area	8.333	30	250	250
Kitchen Prep and Create	10	20	200	180
Pantry Space	2	10	20	56
Offices/Admin	6.666	30	200	200
Storage #1	100 (items)	1/item	100	100
Community Room	20	30	600	810
Restroom1	1	70	90	95
Restroom2	1	70	90	95
Restroom3	1	70	90	95
Laboratory / Classroom	12	30	360	420
Mechanical Chase	0	10	20	20
Utility Access Hall	8	25	200	235
Total Required vs. Proposed Sq.Ft. (Interior w/ Exterior Porch)			4,738	5,149
Total Required vs. Proposed Gross Sq.Ft. (Interior)			2,738	3,165

This table was executed using the expected number of active building occupants for CUED, as per IBC Building Code for an Assembly Type A building or occupant spatial requirements related to room types and fire code. This matrix allows capacities to be determined per room.

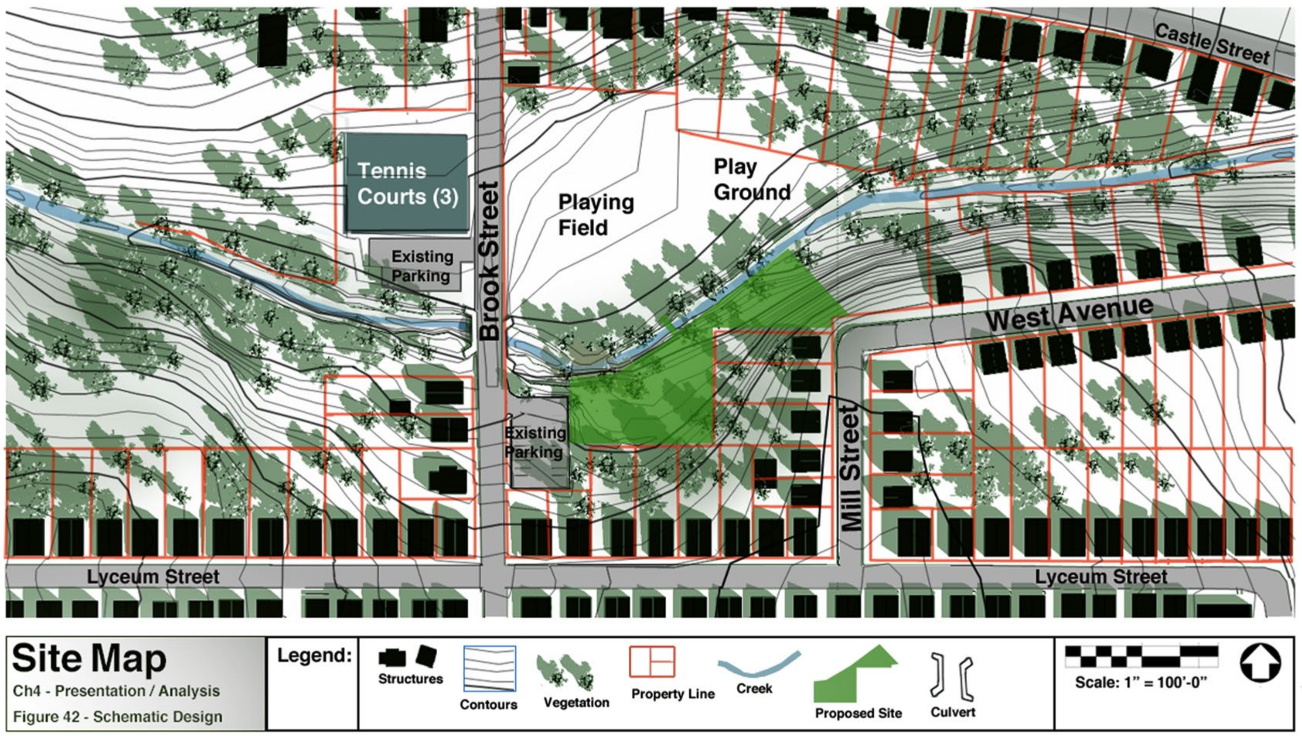


Figure 30. The approximate 30,000 sq. ft. Plot of city owned space in the Brook Street Park Proximity on the south bank of Castle Creek. Site Map by J. Nicholson

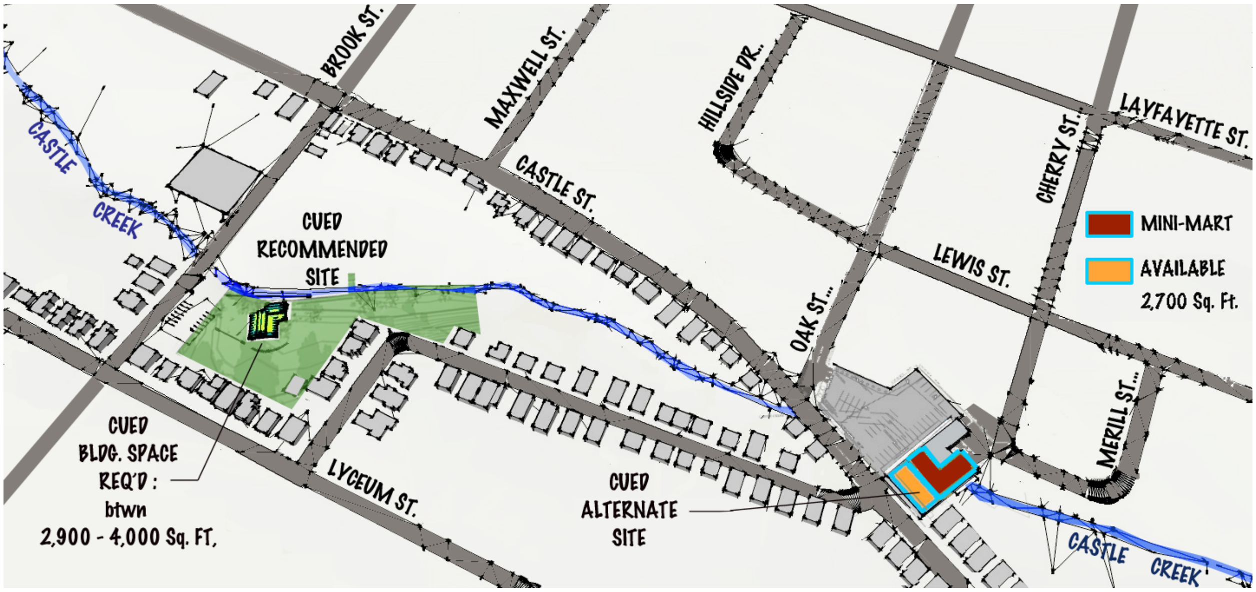


Figure 31. Comparison of the city owned "urban forest" space (left) vs. a potential adaptive re-use space (right) also along the creek. Illustration by J. Nicholson

Figure 32. A rendered plan contrasting examined functional spatial use (2,300 SF): Case study from Chapter 2, Adapted from the Bechtel Environmental Classroom, Smith College, Whately, MA. Original plan by Coldham & Hartman Architects (color coded added by J. Nicholson for specific comparison use for this thesis.)

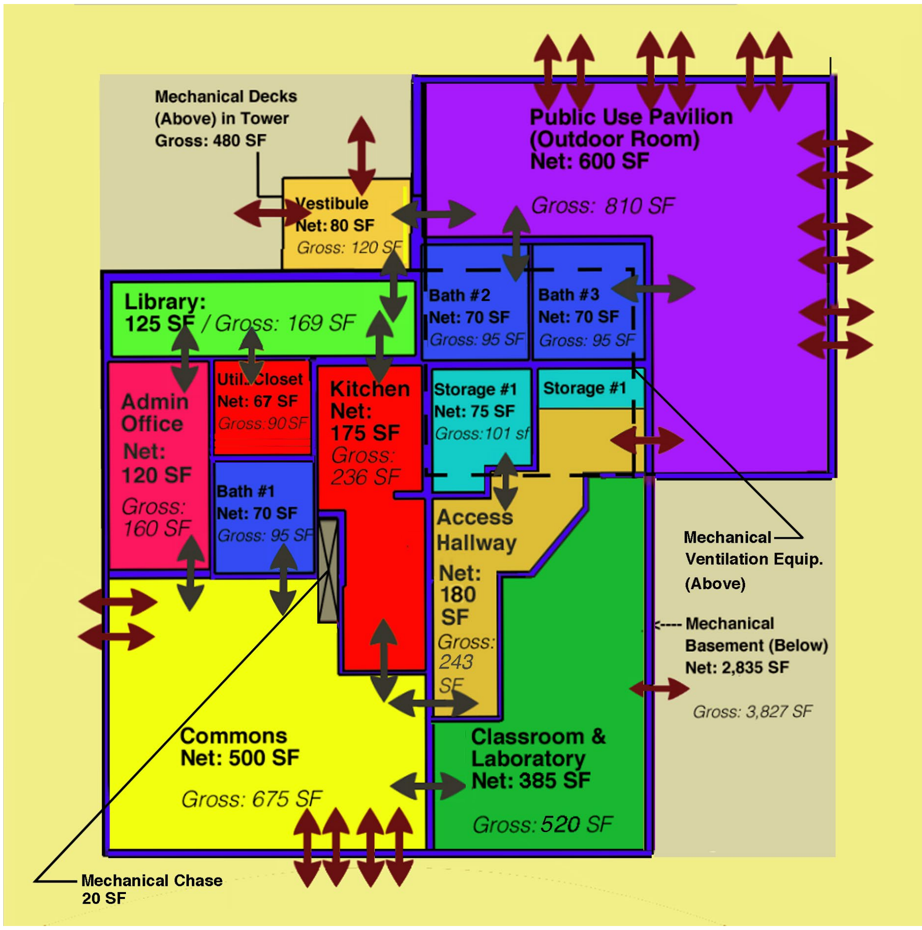


Figure 33. Schematic Spatial Program for CUED at recommended location at Brook Street Park.

Figure 34. A 2010 View of the main façade of Madia's building – Photo by J. Nicholson.

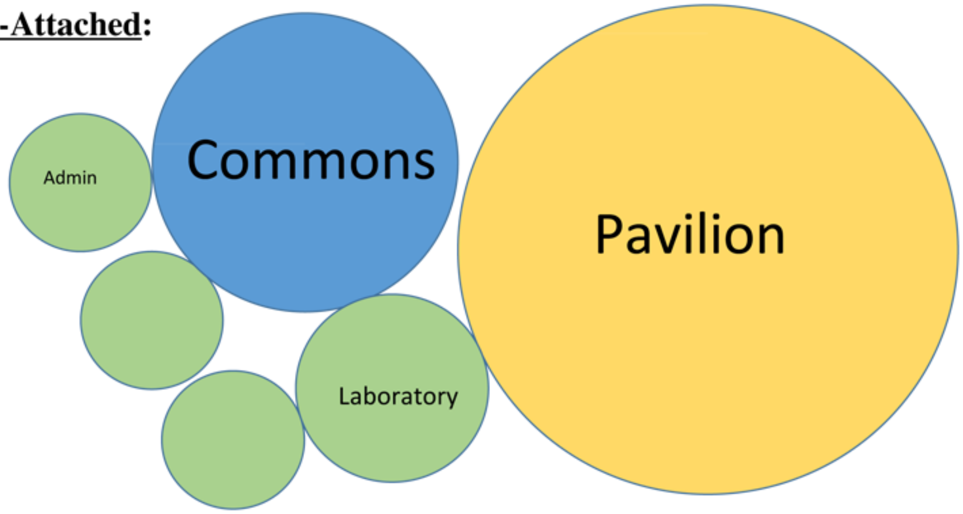
Urban Forest Setting (Site #1)

The setting around the proposed Site #1 location is defined as an open space, public park, and partial urban forest—especially along the creek and to the west of Brook Street, all the way to where Geneva's city boundary meets the town. The grounds along Castle Creek have many trees but they need maintenance after decades of neglect. These tall trees are typically oaks, maples, walnuts, black locust, and chestnuts. Horticulture is connected to the neighborhood of Castle Heights and these collections are maintained by residents. The creek, however contains fallen trees due to recent erosion or perhaps from recent storms, and they lay very close to the creek bed. The sound of the water is something special and can be best heard when there is a steady creek flow. When the flow is just a trickle, no sound can be detected, however moving water is still sensed.

Site #2 (Adaptive Reuse)

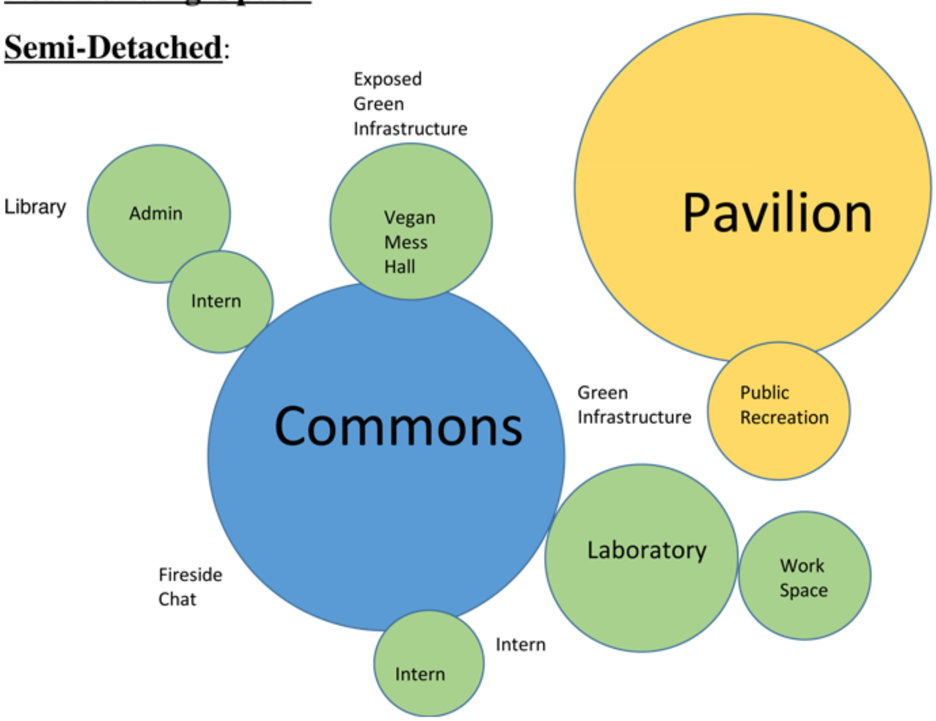
Adaptive Reuse Option

Semi-Attached:



New Building Option

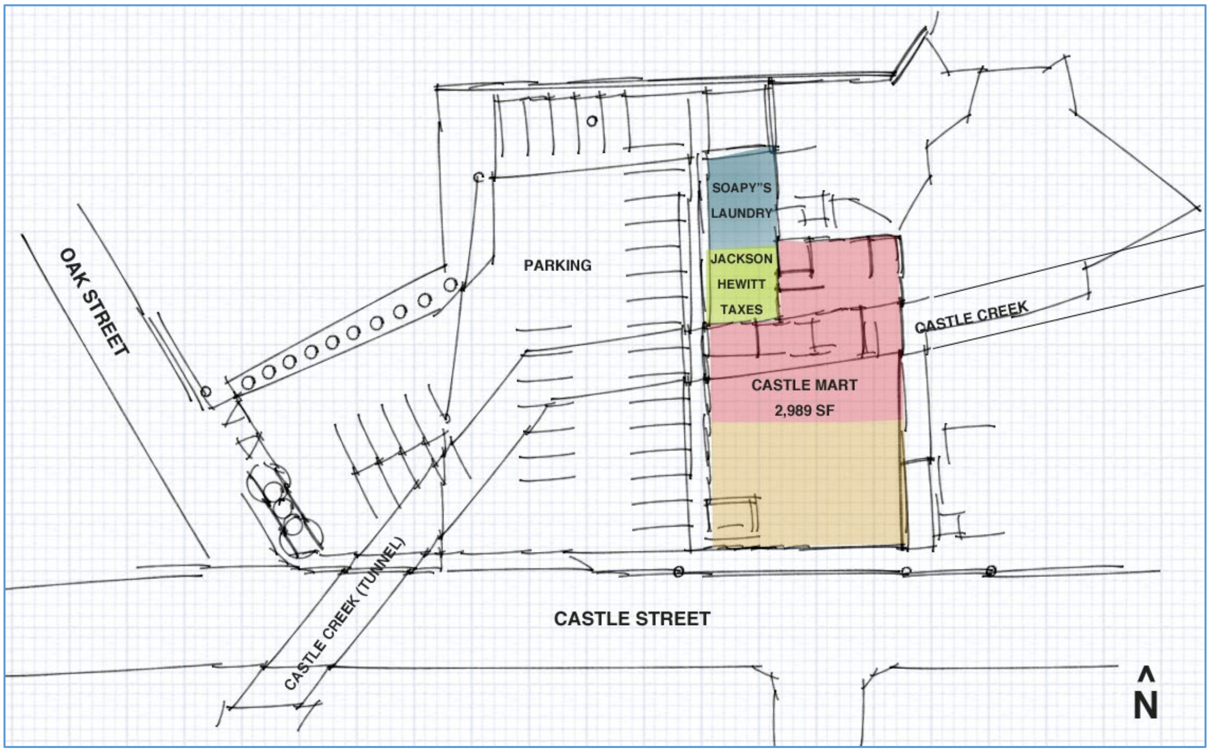
Semi-Detached:



Site #1 (Urban Forest Setting)

Figure 35. Spatial Bubble Diagrams "Option #2 (Adaptive) vs. Option #1 New Building (Urban Forest)

The bubble diagrams in Figure 35 were used to demonstrate a spatial exercise in contrasting the potential site selections. These bubbles helped determine spatial programming as regions either semi-detached or semi-attached, with detached understood as a new building still being organized during analysis and assessment for unforeseen attributes, while semi-attached is in an already formed volume (adaptive re-use). Figure 36 shows an adequate volume for CUED.



Occupied:
Blue – Soapy's Laundromat
Green – Jackson Hewitt Tax Services
Magenta – Castle Mart (Newly Established Business) 5,000 SF.
Unoccupied / Available
Orange – Former Big M Supermarket (1/3 is used for storage currently) 2,700 SF.

Figure 36. Alternate (Option #2) Location- Adaptive re-use ""orange zone" in available space. Sketch based on 2016 survey showing Castle Creek tunnel (216 linear feet). Sketch by J. Nicholson.

As part of the initial consideration for a building as an adaptive reuse, a former grocery store building was assessed. The former Madia's Big M Supermarket location, with 2,700 sq. ft. available floor space, is a one-story commercial building comprised of concrete foundations, concrete masonry block, and floating slabs. The building was partially determined to be inadequate for the CUED because it competes with the urban forest environment, shares parking for three established businesses, and is in a monolithic structure that in fact covers a meandering footprint of Castle Creek (Figure 41).

The owner of "Castle Mart" has recently made capital investments to this property in order to operate his convenience store, an area of 5,000 sq. ft. area. It leaves adequate space for what is required for CUED in the leftover vacant space of roughly 2,700 SF. Also noted in Architect Dan Long's report Project *Location: Madia's Big M Plaza - Castle Street, Geneva, NY, 2/2017*, based on existing conditions drawings, the renovation work remains suspect as to some structural integrity in the concrete. Assumedly, even the mention of deflection may indicate concrete slab issues already in existance. He notes in his drawing:

"Existing Area of **Floor Deflection** to be Repaired" (Dan Long, Registered Architect, 2017).

A site survey by a professional consultant was conducted on May 3, 2016, and provided to the architect. The underground tunnel for Castle Creek is shown in a reproduced sketch based on this drawing (Figure 36). The tunnel appears located at the centerline of the creek flow. This trajectory, however, is assumed to be relevant to existing hydrological data peak discharges of water in underground tunnels - can stress infrastructure. Additionally, general research on hydraulic pressure during floods, when applied towards the investigation of this site, may illuminate unforeseen dangers on aspects of the property above Castle Creek and photographs (Figures 37–41) at the tunnel show alarming rates of erosion abutting the foundation of Madia's east portion of the overall structure.

Flash floods are to blame in part with ground saturation and poor property maintenance contributing as well. Based on U.S. Geological research last published in November of 2016, by Cristopher P. Konrad, a Research Hydrologist in the USGS's Water Resources division in Tacoma, Washington, he stated, in his publication *Effects of Urban Development on Floods*

> Streams are fed by runoff from rainfall and snowmelt moving as overland or subsurface flow. Floods occur when large volumes of runoff flow quickly into streams and rivers. The peak discharge of a flood is influenced by many factors, including the intensity and duration of storms and snowmelt, the topography and geology of stream basins, vegetation, and the hydrologic conditions preceding storm and snowmelt events. (Konrad, 2016, USGS)

Using Konrad's observations, if we take the case of Castle Creek at the Madia tunnel, the stream flow is gradually cutting into the slope beyond the tunnel (Figure 42). When there are peak discharges, the cutting effect of the backwater intensity on the landmass adjacent to Madias will be seen. These hydrologic conditions are only exacerbated by major rainfall events.

Re-use Adaptive (Site #2)

A consideration of the CUED option #2 located design addresses the feasibility of an adaptive reuse proposal and relates to all existing structural conditions. For example, the "floor deflection" stated in a schematic drawing by the architect, is assumed to be an ongoing maintenance commitment, especially as this aging structure is situated directly over the creek. Unforeseen outcomes at this structure such as structural integrity that may be compromised by the frequent super storms in the northeast would not serve the interests of CUED. Which is not to say that option #1 also wouldn't face storm outcomes. It would, but the site is more predictable based on FEMA flood map information. Option #2 is in an aging structure. This is especially pertinent as research has shown that hydraulic pressure on old precarious structures in Geneva, directly above the creek, have historically been threatened by flash flood events. Additionally, super storm effects add hydraulic pressure to underground foundation walls, similar to what happened during a

May 14, 2014, in Penn Yan, NY where a flood event devastated the village's commercial district. According to an executive report published on March 31, 2015 for the 2014 Annual Report, prepared by the New York State Division of Homeland Security & Emergency Services Office of Emergency Management (part of the New York State Disaster Preparedness Commission), Penn Yan was declared a state of emergency during the aftermath of a significant flood. "The village, with a population of slightly over 5,100, endured a horrific early morning deluge of water approximately 8 feet tall…This torrent swept away one home, into the Keuka Outlet, and many other homes were declared unlivable afterwards" (2014, p.11). According to the report, rain fell at a rate of over 1 inch per hour for several periods between mid-May and early June, leading this author to speculate similar damage in Geneva should a similar storm event occur.

CUED Site #1 VS. CUED Site #2

Two driving criteria towards one selected site have much to do with two separate site design considerations along Castle Creek. To make CUED's program available, the overall location for Site #1 is at Brook Street Park and will require one-half of the available space in a roughly 30,000 square foot zone within the recreation/open space district that is available to develop within the City of Geneva. The designed building footprint includes covered porches of approximately 4,700 square feet within the plot of city-owned land. This also includes pathways, a grand stair, and gardens to occupy nearly 15,000 of the 30,000 square feet. This footprint is an estimate but is within range of the feasibility study. Adjacent to Site #1, a 2011 precedent project by a local architecture firm, In:Site Architecture of Perry, NY, explored design options as seen in the Figure 49 scheme regarding the Brook Street site as a primary location for pavilions and pathways. These precedents have served almost exclusively as the primer for using Site #1 and no other location had been fully considered. However, it was assessed that further exploration of an alternate site (Site #2) be executed for evaluation purposes. This second site is a former supermarket, concentrically located within the City of Geneva, and also near Site #1. This building, as a candidate for adaptive design, has available space of roughly 7,700 gross square feet (Figure 30). However, within the timeframe of writing this thesis, some of that floor space has become occupied by a new tenant; a mini-market that now resides in approximately 5,000 SF of that space. Today, according to the drawings provided by Dan Long, R.A., and after personally doing a measurement takeoff, only 2,671 gross sq.ft. is left available for design consideration at Site #2. This has been interpreted from reviewing as-built information of the Madia's building available spaces. The CUED program requires between 2,738 and the projected 3,165 gross square feet space and a mechanical basement of 2800 sq.ft. Not to rule out the former supermarket, because the available square footage is roughly feasible, but the CUED program space would be greatly scaled back here should a design be retrofitted into the former building if the design needs additional space. Indeed, this building still provides sustainable features when used as an adaptive reuse project, such as simply recycling a building. But there is concern because the creek runs right underneath it and is potentially a future structural compromise. Another consideration to address, are the houses nearby this structure. Several homes are sitated so close that they are practically attached and would hear and see some of CUED's functions; those residents may object to not having enough privacy from student research or events. Figures 41–45 show how close one house is in proximity to the site as well as the torrent of Castle Creek, thus revealing explicit indications of additional potential issues. Madia's was built and had operated out of this location since 1960 (FL Times, 2014). Prior to the 1960 construction of the Madia Family Supermarket Plaza, a 90 yard (length) culvert/tunnel directed Castle Creek inconspicuously away from what was its natural flow process that once used by Geneva's earliest settlers. Purportedly, Madias was built over a small glen and was perhaps the site of an old mill. However, there is no historical evidence to support this claim. What is known, is that a large tunnel exists here today. The man-made tunnel was the work of an urban renewal project whose planners paid little attention to the law of natural creek meandering. It can also be assumed that the turbulence of the flowing creek, during large storms, causes considerable erosion once quickly moving volumes of water exit the concrete tunnel and backflow against the landmass adjacent to Madia's foundation. The photograph shown in Figure 42 reveal an alarming rate of erosion at the tunnel's exit, just east of the foundation wall, along the embankment. In fact, parts of the building appear to have washed away in recent years by either erosion or structural decay, as was seen with a small concrete pad/landing, near an exit door. Additionally, information acquired from historic satellite imagery in 2005, 2010, and 2014 show Castle Creek, at times, up to its crested banks (Google Earth), most likely during heavy rains. A 2016 Finger Lakes Times article regarding a homeowner's dilemma, titled "Nightmare on Geneva's Elm Street" epitomizes one type of tunnel concrete stress being further exacerbated by Castle Creek's volumes of water when forced into an unnatural path. It could be assumed, that the interment of the creek made over 100 years earlier, is a factor in infrastructure failure. The big question becomes, based on observations and actual events, is there a risk in occupying any structure where a large amount of water is flowing quickly beneath the foundations that support the building? It would seemingly make more sense to not design anything greater than the 2700 sq.ft. available in a building about to fail. The current CUED design again requires at least 2,700 sq.ft. of space for its program. More significantly, flood damage is an ever present risk, especially with climate change, and its effect on typical rainstorms strengthening into super storms that offer deluges of water. Either location would involve significantly strengthening the foundation work against the physical force of strong creekwaters and against urban flooding. And what is urban flooding? According to a specialized consulting group, Rimkus Consulting Group:

> Urban flooding is a phenomenon that occurs where there has been man-made developments within the existing floodplains or drainage areas (e.g., new residential communities, retail

> establishments, commercial buildings, parking lots, etc). The changes may either increase the amount of runoff or reduce the capacity of the natural drainage channels. The addition of impermeable surfaces (such as asphalt or concrete pavement) increases the speed of drainage collection, overwhelming the drainage system. Changes to the shape, slope, or direction of the natural drainage channels to better suit development may reduce the capacity of the channel. An aspect of urban flooding that is typically not found in "natural flooding" is the potential of subrogation of legal damages against developers that modified the natural or original drainage system. (Rogers, 2017, page 3)

Simply knowing how damage caused by storms such as hurricane Harvey, in Houston, or the ongoing deterioration of storm water sewer systems in Geneva (due to super storms) may pose legal risks for a permanent public building at the Madia property. The risk is likely too great because numerous past events in Geneva can be connected to more recent problems seen on the Creek. Historical evidence presented in chapter 1 already highlights flooding to the east side of Madia's. Recent empirical evidence, by this author's use of digital photographs (Figures 41–45) suggests that the tunnel under Madias may at some point become inundated with too much water flow, thus the erosion at its exit, during flash events is a problem. Based on no shoring visible, erosion is expected to continue to the residential parcels directly east, adjacent to the Madia's parcel when the water escapes that tunnel. Water pools backwards against exposed earth and erosion limits the force that supports Madia's substructure against the earthen mass. Assuming this continues, a loss of the mass of earth that holds Site #2's foundation in place, will require some type of heavy underpinning and shoring to the crumbling concrete base—to mitigate cracking and further floor stress or potential deflection. However, the opportunity here is to reopen the creek with partial removal thereby mitigating aforementioned issues and reconstructing the site to be more respectful of nature.

Figure 38 shows the as-built of Site #2. Essentially, the investigation of Site #2 helps provide a viable alternate option and serves to hopefully validate Site #1. Simply, the available parking spaces at option Site #2 helps to bring visitors into CUED yet the absence of park space and lack of creating natural beauty, as it exists in Site #1, makes the recommended (Creekside) Site #1 location the better candidate. The balance of parking spaces, views to the creek, easy access to recreation, and the children's playground is better at this site. Site #1 also allows the neighborhood residential scale to be enhanced by a unique building. Site #2 could never allow k-college students access to the waters edge as safely as Site #1 does. The crumbling infrastructure of site #2 is cause for alarm, should more frequent rain storm events further stress the walls of the tunnel below it; there is no sense to occupy this space. There is very little sense of place at Site #2 versus Site #1. The aging mid-century building has hopes of still being fully filled commercially, but the commercial atmosphere conflicts with the proposed walkable covered porch, space for native specied gardens, and trees towering above a lodge like building. CUED must be characterized by its function related to recreation. Site #2 is not a blighted zone, but the constant ebb and flow of car traffic here can have a negative impact for a nature center's yearrning for tranquil environs. Site #2 is also too attached to the car. Perhaps it is too close to downtown Geneva as well and as such cannot escape commercialism's effect. Perhaps the long term solution for Site #2 is the demolition of some or all of the structure and parking to repurpose the creek to be more like its natural setting.

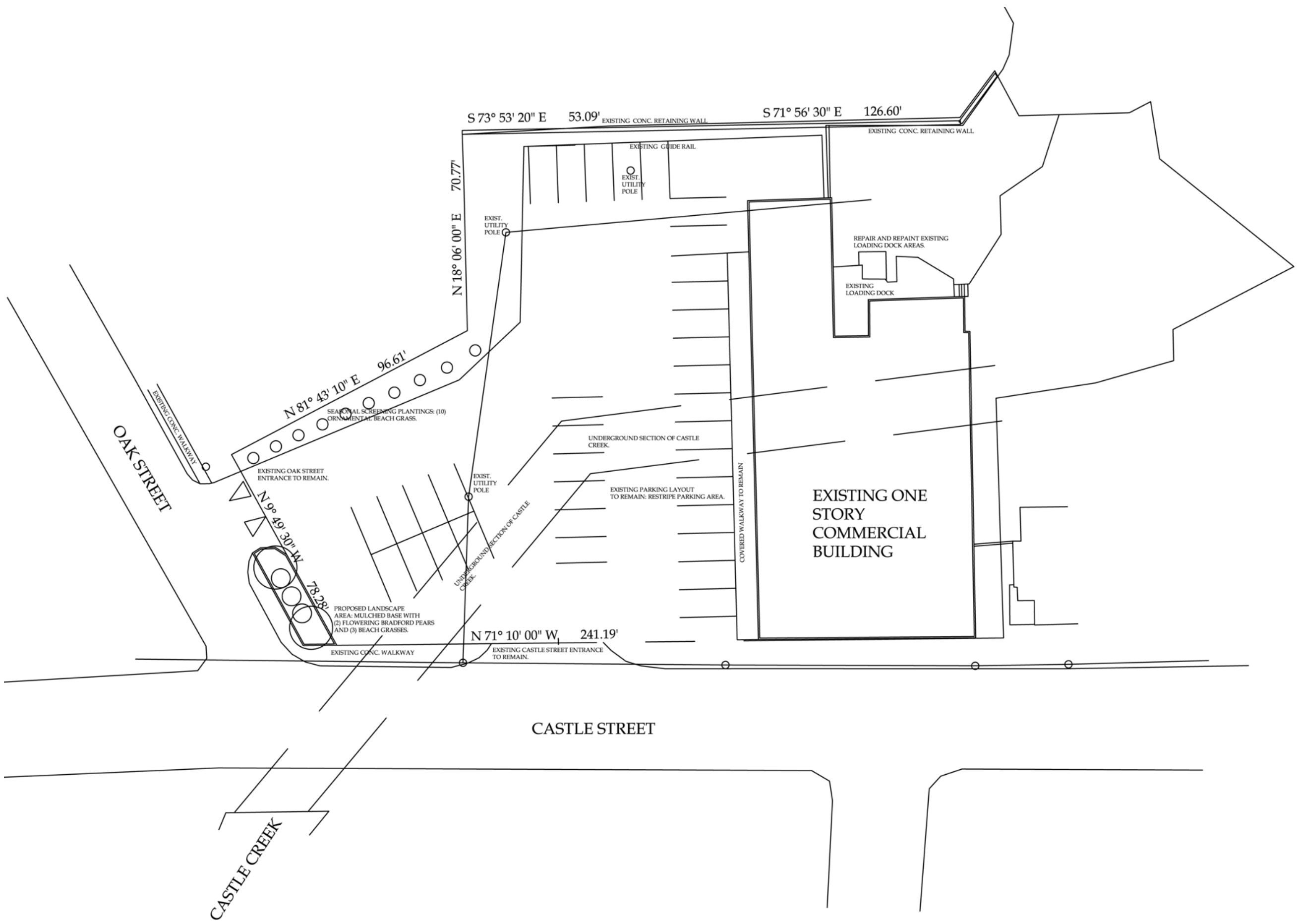


Figure 38. As-built drawing of existing Madia's, from Dan Long, Registered Architect., January, 2017. Geneva, NY

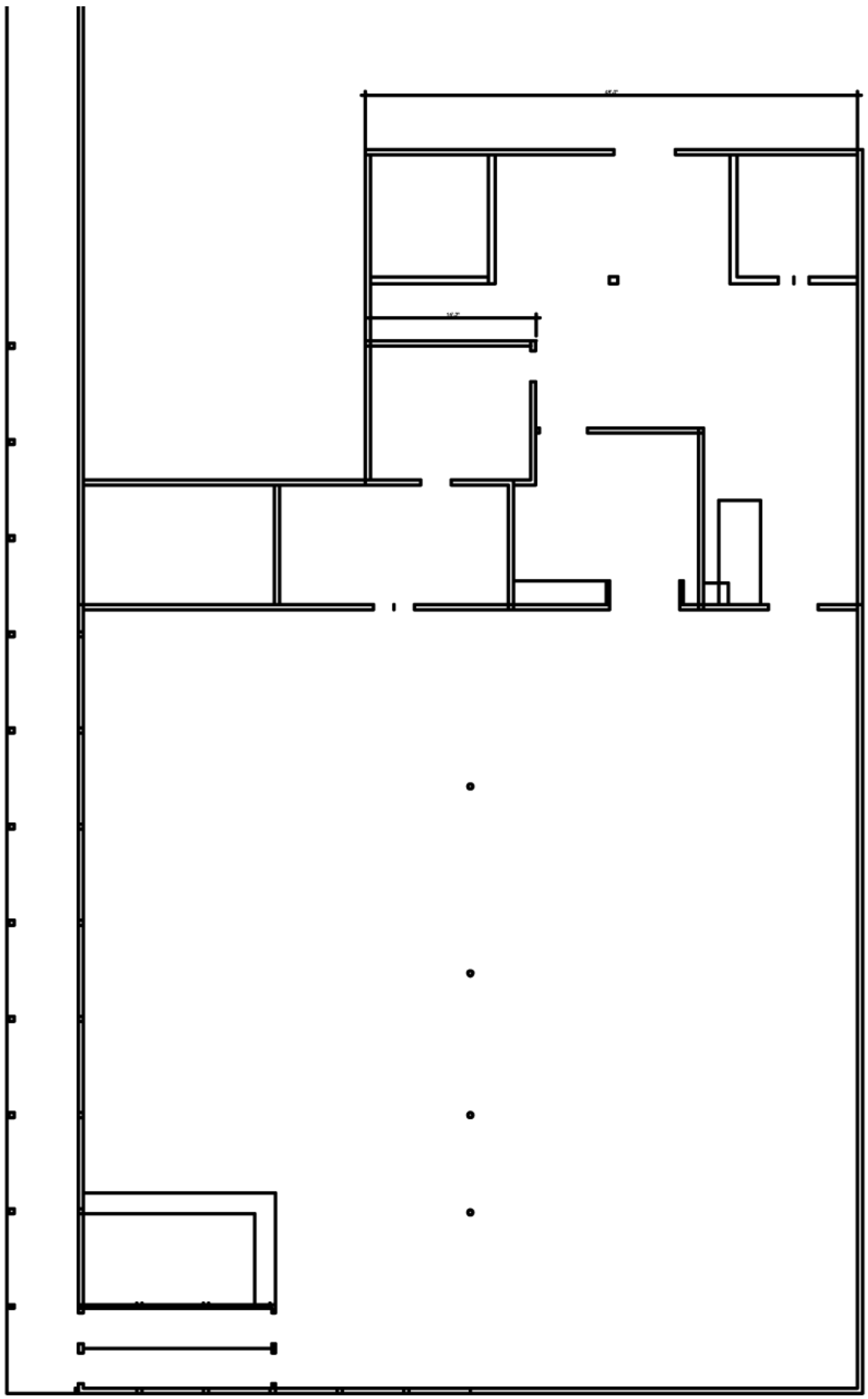


Figure 39. As-built drawing of existing Madia's, from Dan Long, Registered Architect., January, 2017. Geneva, NY

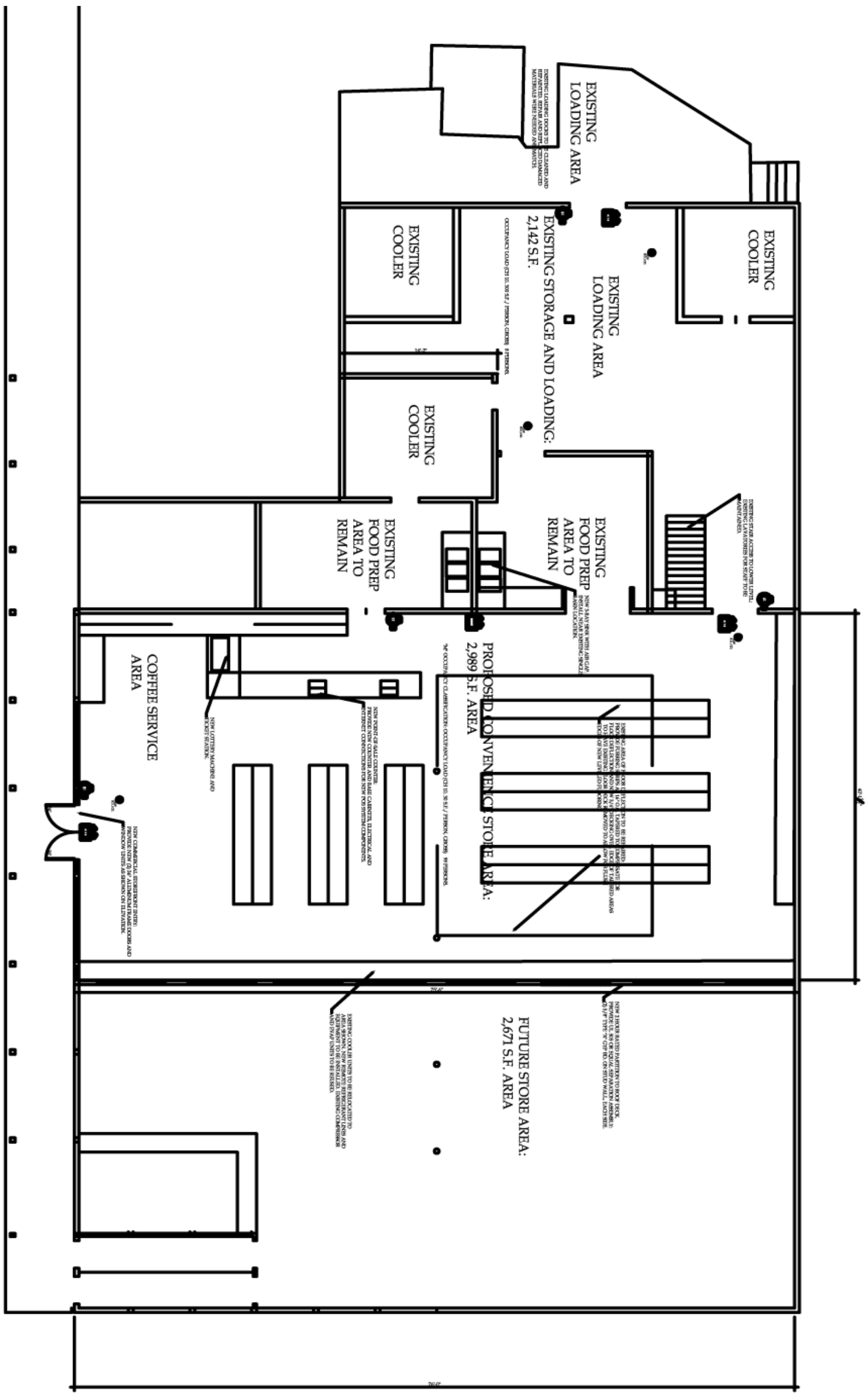


Figure 40. As-built drawing of existing Madia's, from Dan Long, Registered Architect., January, 2017. Geneva, NY

Figure 41. View of Castle Creek tunnel end, looking east, parallel to Merrill Avenue – Photo by J. Nicholson. 2017

Figure 42. Perpendicular View of the creek looking south, to eroded bank on Castle Creek from Madia's building's east tunnel end, along the east foundation wall, perpendicular to Castle Street – Photo by J. Nicholson. 2017

Figure 43. View of Castle Creek at tunnel end, along the east foundation wall of Madia's building – Photo by J. Nicholson. 2017

Figure 44. View of Castle Creek at tunnel end, along the east foundation wall of Madia's building – Photo by J. Nicholson. 2017

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Figure 45. View of Castle Creek at tunnel end, along the east foundation wall of Madia's building – Photo by J. Nicholson. 2017

Figure 46. View of existing loading dock area to the Madia's building – Photo by J. Nicholson. 2017

Figure 47. A typical storm water pipe into Castle Creek. – Photo by J. Nicholson. 2017

Figure 48. A storm water pipe into Castle Creek at Brook Street Park – Photo by J. Nicholson. 2017

The Selected Site

The final decision is for the CUED project to be built on Site #1 because it has an urban forest environment that is in a modernized storm water management area and is in a city park that is open to the idea of such a venture. Further storm water management (SWPPP) for the CUED building is needed and based on flood maps, the construction project can be done within proper means through site engineering efforts. Site #1 is the better choice for a building to be closer to the creek, which then supports the goals for k-college education programs, while blending with recreation and several pedestrian accesses. Site #1 will use existing parking while not adding new and will take advantage of key beneficial neighborhood attitudes that are already align with the philosophy of such a building. The site decision is made based on several opportunities at Site #2 (Madia's) however, structural integrity and storm water issues could become much costlier to maintain at Site #2 based on the site assessment. The square footage at site #2 is barely adequate and no garden space is available there. Site #1 and its urban forestry surroundings provides garden spaced grounds, as well as closeness to the trickle of the creek, space for paths, steps, and it singularly places itself without three businesses as the Madia's plaza has as its commercial micro-district. CUED, in Site #1, is a single entity. Site #1 is presently an established park and an emphasis of the creek is already present.

Previous Proposal

In 2011, In.Site: Architecture, with offices in both Perry, NY, and Geneva, developed a park refurbishment design (Figure 49) that was built with a new handicap accessible ramp and walkway along the north edge of the creek. Figure 49 shows the city property lines and the park zone owned by the city. Principal architect Rick Hauser, AIA, mentioned that the overall program called for better accessibility but his firm also envisioned a structure that would bridge the creek near Brook Street (Hauser, 2015). This design is considered within this thesis, as a case study, especially the emphasis idea of using the creek as an integration within architecture. Conversations with Mr. Hauser were valuable to me because of his previous design explorations and because of his connection to the same site.

Figure 49. In:Site Architecture 2011 plan for Brook Street Park. (Geneva, NY)

Image courtesy R. Hauser, AIA, Principal, In:Site Architecture.

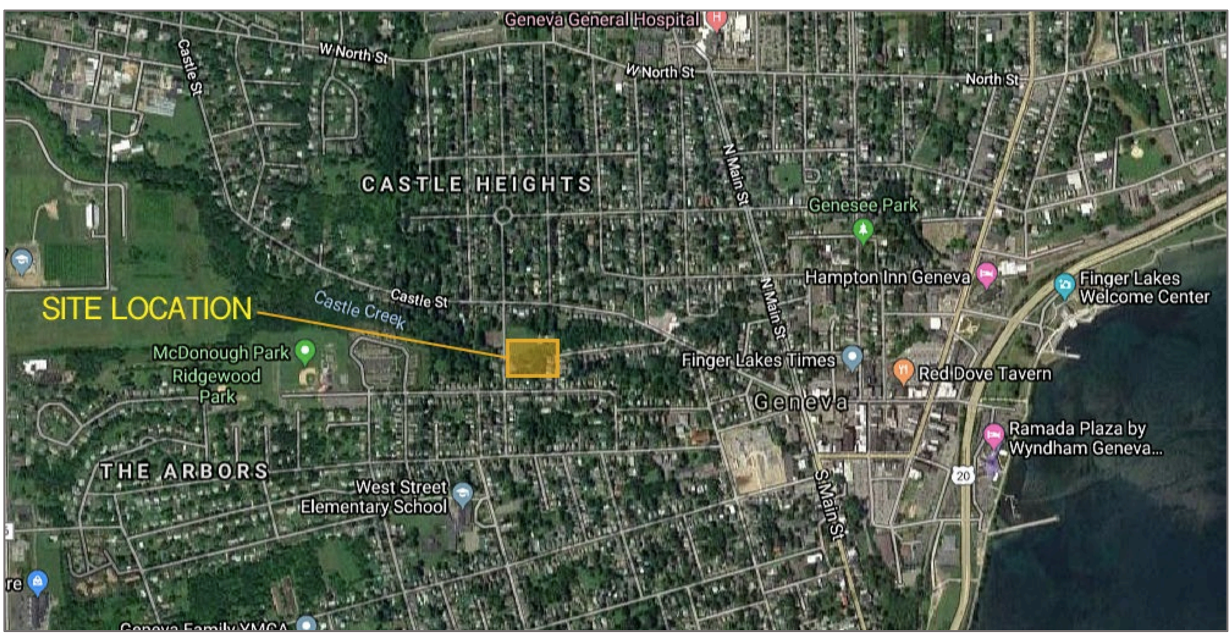


Figure 50. 2015 Google Map of Castle Creek in Geneva. Retrieved from http://www.google.com.

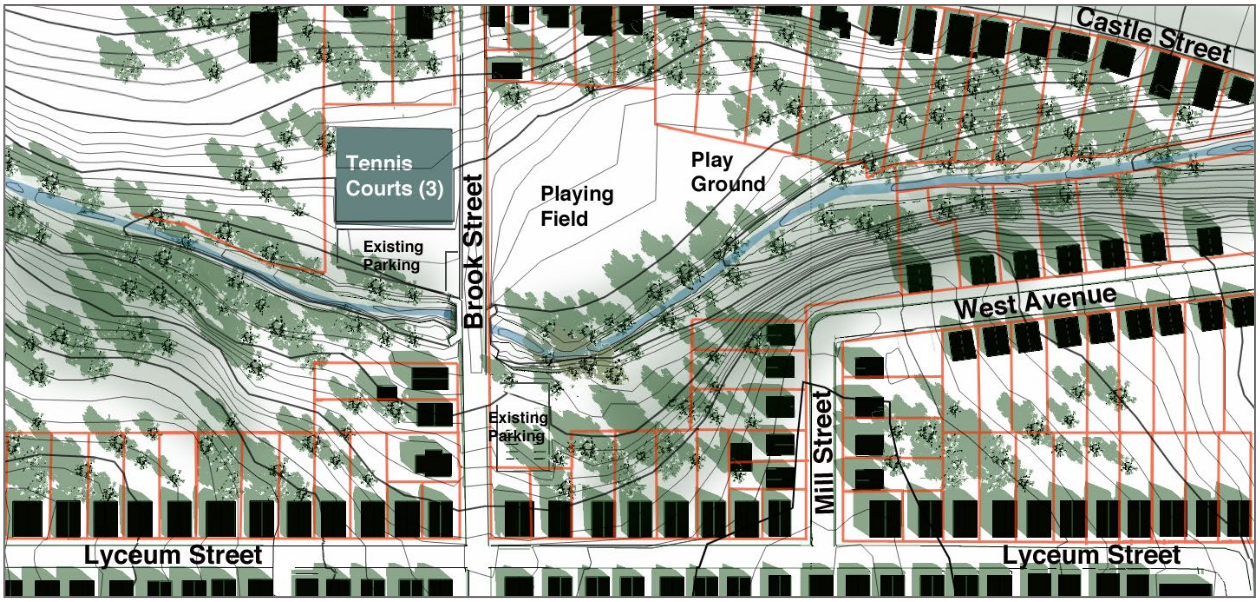


Figure 51. Figure Ground rendering of Neighborhoods at Geneva's Brook Street Park. Castle Creek bisects two neighborhoods situated to the North and South, flowing east through a small glen. It flows through the park characterized by an "urban forest" surrounding. (Image courtesy J. Nicholson)

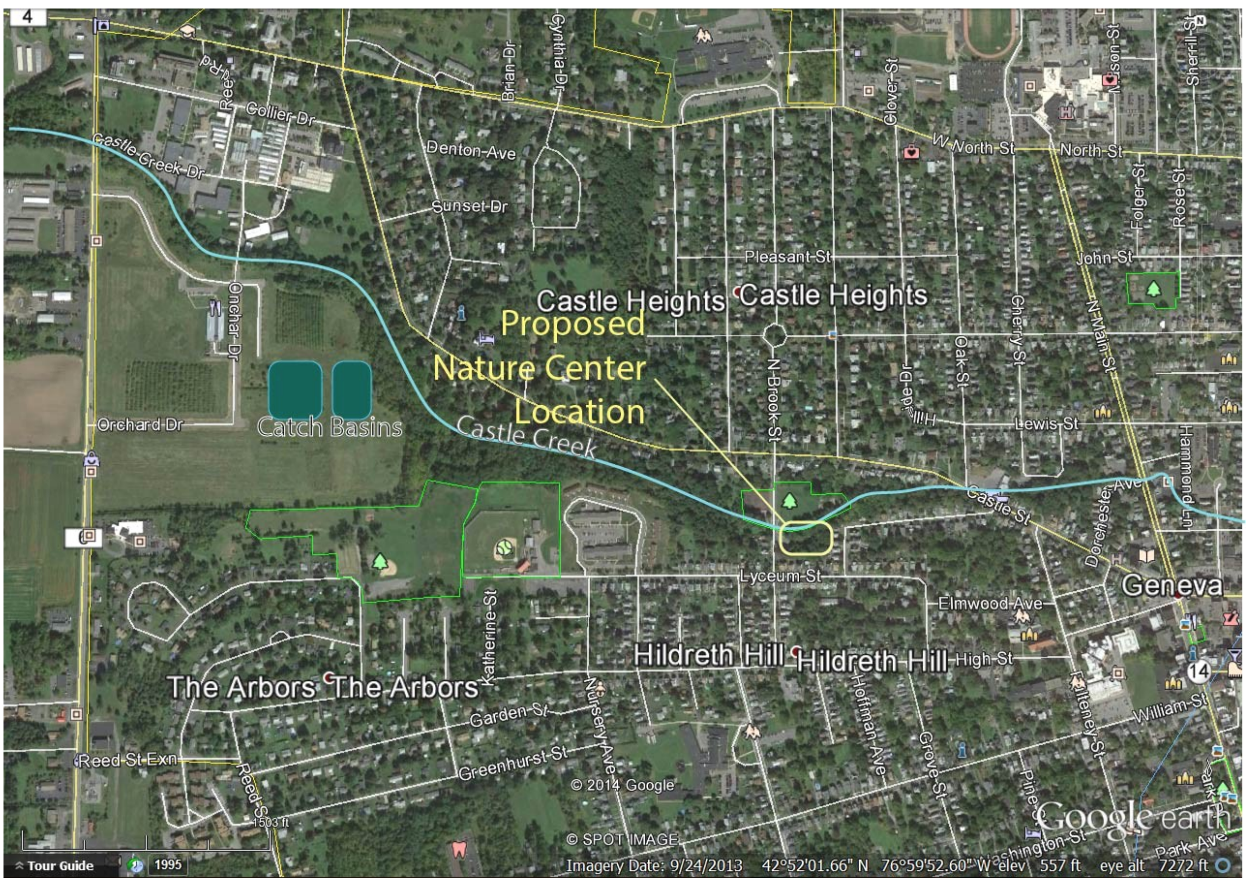


Figure 52. City of Geneva satellite image showing NW section. Acquired Aug 30, 2015 with superimposed graphic location indicator (background image courtesy of Google Maps).

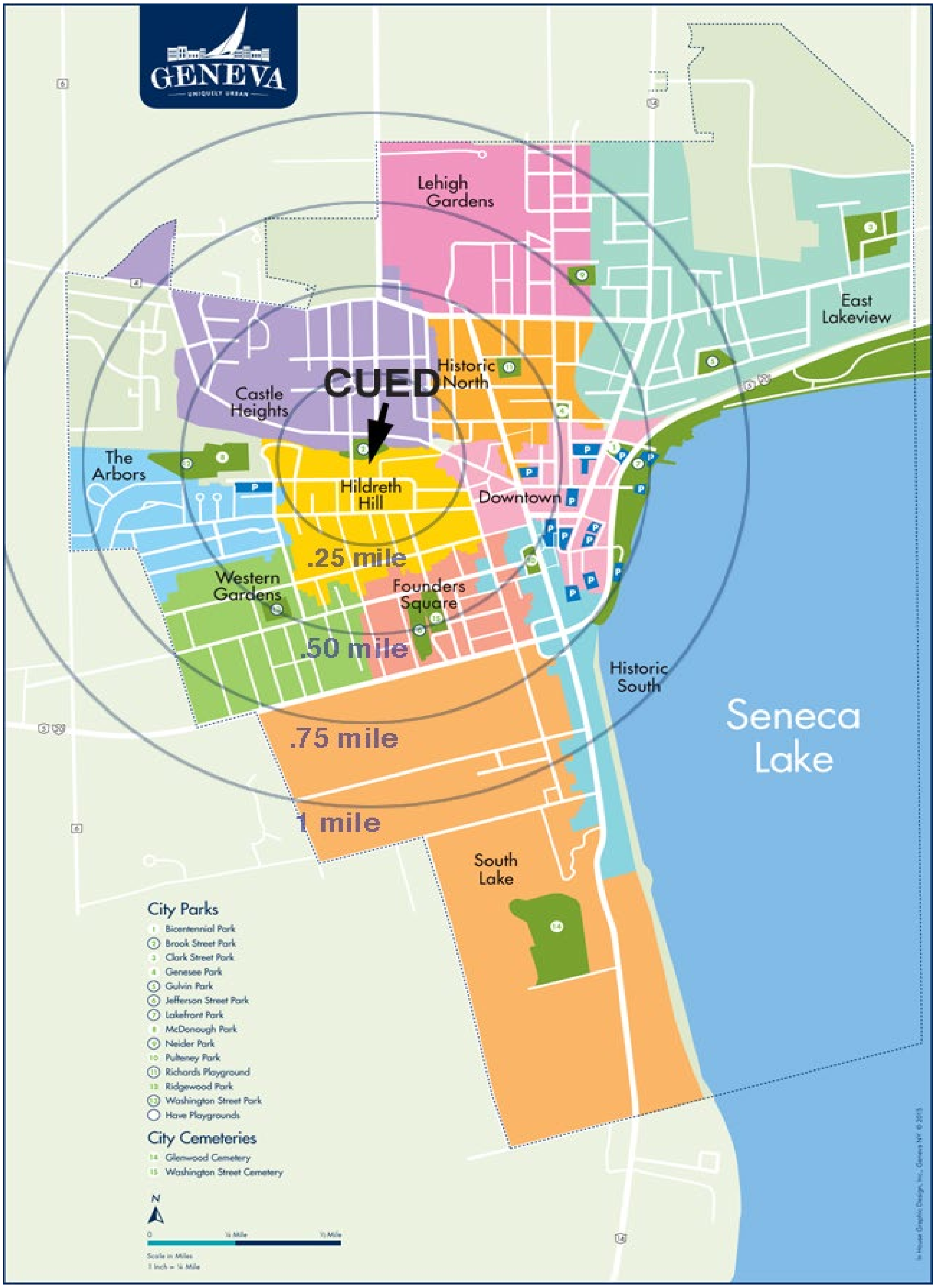


Figure 53. Neighborhood Map / Geneva Neighborhood Resource Center – 2015 Map: http://cityofgenevany.com/wp-content/uploads/2016/09/GenevaPart2FINAL.pdf

Conclusion

This chapter has dealt with the analysis and programming geared towards the outcome of a built public service and natural setting preservation. By using precedent studies, previous proposals, sample surveys, empirical data (surrounding two sites), and examining as-built information – a clear indication has been made by this author regarding where to place such a building. This building proposal is motivated upon the assumption that the best building, the best site, the best program, and functional delivery of a finished product is most suited to a single user and the collective community in Site #1. The analyses carried out have helped determine the best and clearest idea and the sample surveys have assisted in turning assumptions into a more clearly administered path and purpose of intent. What was learned most is that project inspiration cannot merely direct intention, but combined modes of understanding can. The analyses and programming section of this paper have become a meaningful part of this research, perhaps the most important effort towards this design. Evaluations based on precedents, mirrored by that of prior programs that have been used to help model this thesis, are vital pieces to the puzzle. Because a design must work to become efficiently modeled these criteria have been used. Prior historical information serves as a basis for design.

Chapter IV: Project Planning and Design

Parti

The portion of the creek selected may be seen as a portal for moving into this creek's domain in a non-obtrusive scope. The parti, symbolized, encompasses obvious traits of placement or mapping—the existing typology of the neighborhood—it's scale, dwellings, regularity or irregularity, repetition, and rectangularity as especially akin to the residential grid. Yet, there is also inspiration by gestural precedents in nature, perhaps even unspecified mathematics used to determine the meandering of a creek. Concurrently, a rotated orthogonal (or diamond) interrupts another rectilinear grid of its neighborhood, that which is further bisected by the spline inspired by the creek's plan or imprint. The CUED idea has used the orthogonal, one smaller orthogonal form as a permutation to the larger parent one. The main structure, as seen in the plan view, has an even smaller orthogonal projection indicating the footprint of a projected piece. Because these forms were complimentary to residential structures, the contextualization of these forms, to curvilinear movement, became the challenging dynamic aggregate of CUED's pedagogical grounding.

To demonstrate the interruption or pathos of the two major forms, two separate metal sketch models were generated from a plasma cut, during a 2015 industrial design class at R.I.T. This 3D study also inspired CUED's design from a sculpture used to illustrate kinetics and creek flow. This orthogonal scheme was derived from recycled scrap metal, a cube divided into two pieces, with one orthogonal piece being replicated after using a sine wave as the bisect. The separation began slowly, as seen in plan view in upper left-hand quadrant (Figure 54). The inspiration being the choreographed movement of a river, in torrent, represents a helical torsion of this cube's two parts. Figure 54 shows an inversion of the division and parts.

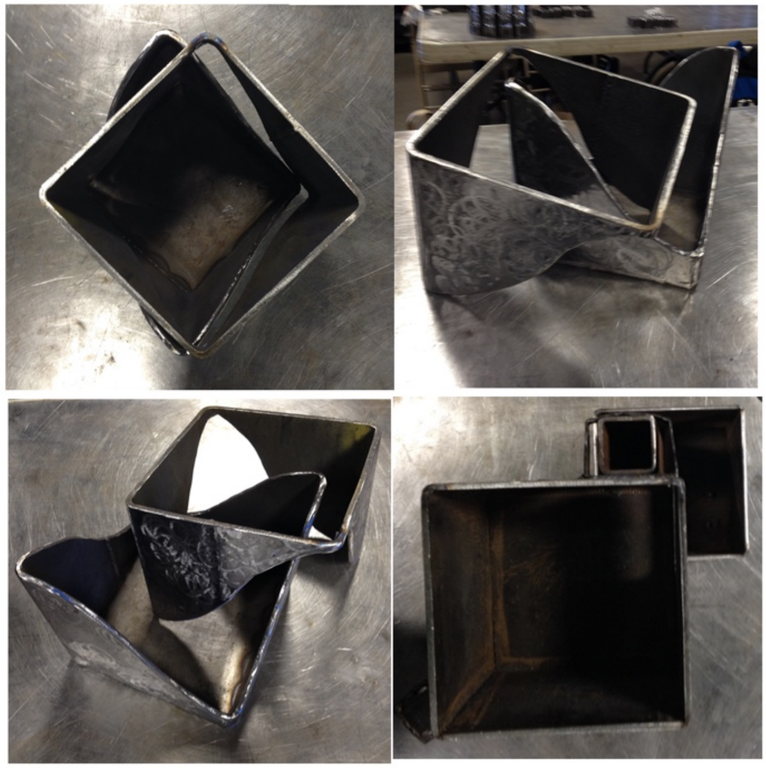


Figure 54. Formalism: Physical Parti sketch as an actualized 3D sculpture form. Sketch Model (J. Nicholson)

These crude arrangements represent organic integrations of forms that serve as the metaphor of what I call *contrasts within boundaries*. They represent modes of arbitrary scales and community dialectics. They symbolize physical boundaries, which are obliterated by free thought processes created by dialogue and debate. Insularity is then a turned-and-opened-ended maze or puzzle to-be-solved. A solution is thus one object form in the foreground, overlaid by the object in the background. The outlets are that which empower themselves to think and further inspire new thought processes. Site consideration has also dictated a phenomenon of form. Geomorphological energy is used as a metaphor. There are mechanics near the creek's edge, the carved form of a small glen, boulders, and stones against soft soil. These are lifting and settling as suggested, what a grid in Figure 55 will tie together seemingly. The parti is concerned with relationships intertwined. Even the process of making the sketch model is considered. Metal yields patterns from a surfaced tension imprint (i.e., a base grinder) and despite this gauged steel, which is considered very rigid, the grinding technique leaves a surface that reflects daylight uniquely from irregularities (Figure 54). This process inspired the surface of CUED for use with stone—partial to metallurgy. The parti is also preoccupied with shifting parts, forced to coexist in a limited space. In Figure 58 the sketch may be seen as the combination of many smaller sized square shapes that serve as a footprint. The bird's eye view of this model was then made into a sketch shown below emphasizing a boundary (Figure 55).

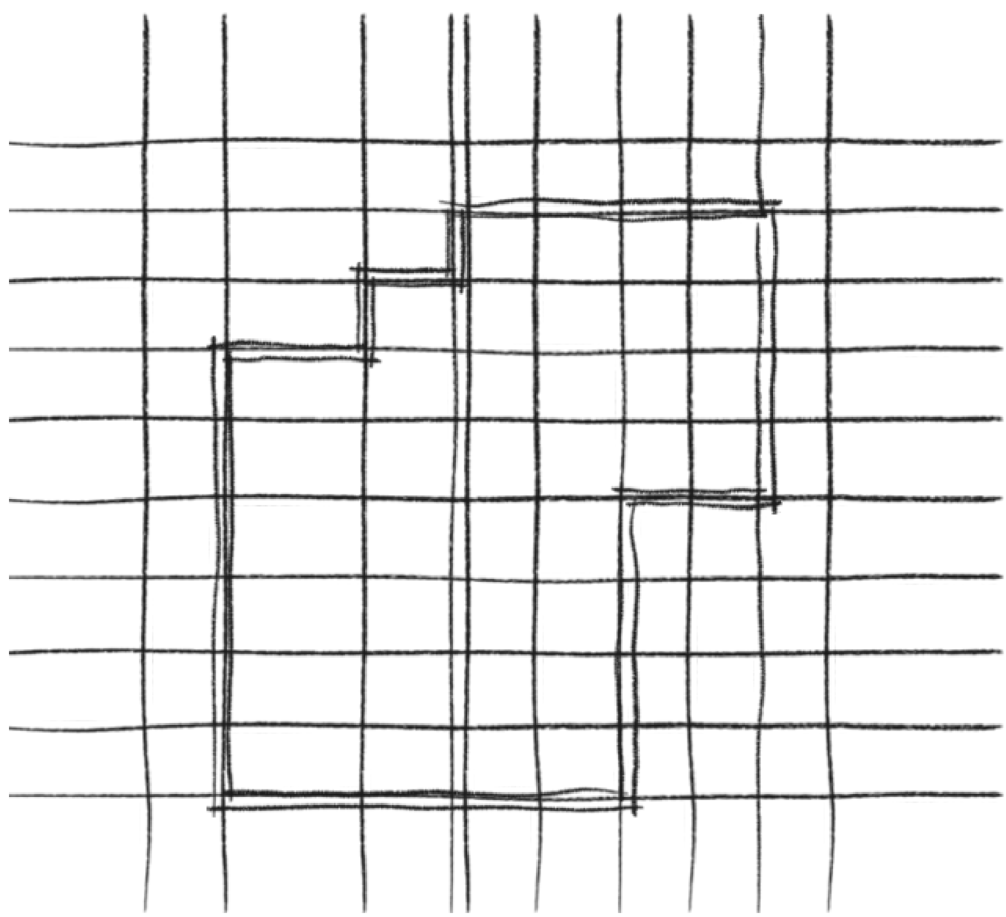


Figure 55. Grid Pattern sketch for spatial programming of a selected form. (J. Nicholson)

To proportionally program the raw idea described in Figure 55, a footprint of the volumes is broken down into a spatial grid for functionality and bridged information. However, the intent of this research is to coax along with an ecological structure, as intelligently considered, as it is informed from the gestural landscape of the natural creek. There must be a sensitive approach to design, so that it will guide the creek's trajectory through contrasting the serpentine bisecting form against a city grid, as a mapped imprint. This thesis is a revisit of In:Site: Architecture's 2011 considerations. It is also being used for proposing other interpretations and additions within a new program, such as including a classroom/laboratory and shared kitchen, along with the pavilion idea as originally envisioned by In:Site Architects (Figure 49).

As the parti becomes the schematic design, it becomes necessary to consider related costs regarding materials and the building's functional spaces. It must feasibly undergo processes that are efficiently and economically envisioned. Table 3 is CUED's spatial program matrix, the programming of the net and gross floor space allows for the breakdown of hard costs and also identifying occupancy types. A dual cost analysis integrates fire rating into the construction of the building and helps provide a thorough takeoff of the schematic design for pricing. The spatial planning element is essential for pre-programming to provide the contractor with preconstruction information. This is useful to the owner so that they will see every penny spent towards the design. Hard costs and soft costs (the portions of the cost related to architect and engineer fees, permitting, green building consultants, and hidden costs) are better tracked with a detailed digital spreadsheet. Building Programming for CUED is generalized here for use within this paper. A rough estimate was tabulated given the use of a pre-programmed template for residential type design in the same region. The template also provides tabulated fields for energy performance modeling.

Zoning Analysis

<u>SITE LIMITATIONS – Setback Requirements   ZONING DISTRICT</u>

Max. Occupied Area: 100%   X-Recreation (Open Spaces Use

District) Min. Front Yard Depth: 20 Ft.

Min. Side Yard Width: 4 Ft, One Side (14' Total)   <u>PERMITTED USES</u>

Min. Rear Yard Depth: 35 Ft   Special Uses; Passive Recreation; Active

Max. Height: 60 Ft.

Recreation: Max. Floor Area Ratio: 500%

(Source: eCode, 2015)

Code Analysis

IBC 2010 Occupancy Classification

Type Building: (BUSINESS – B) and (ASSEMBLY A-3)

Schematic Design Drawings

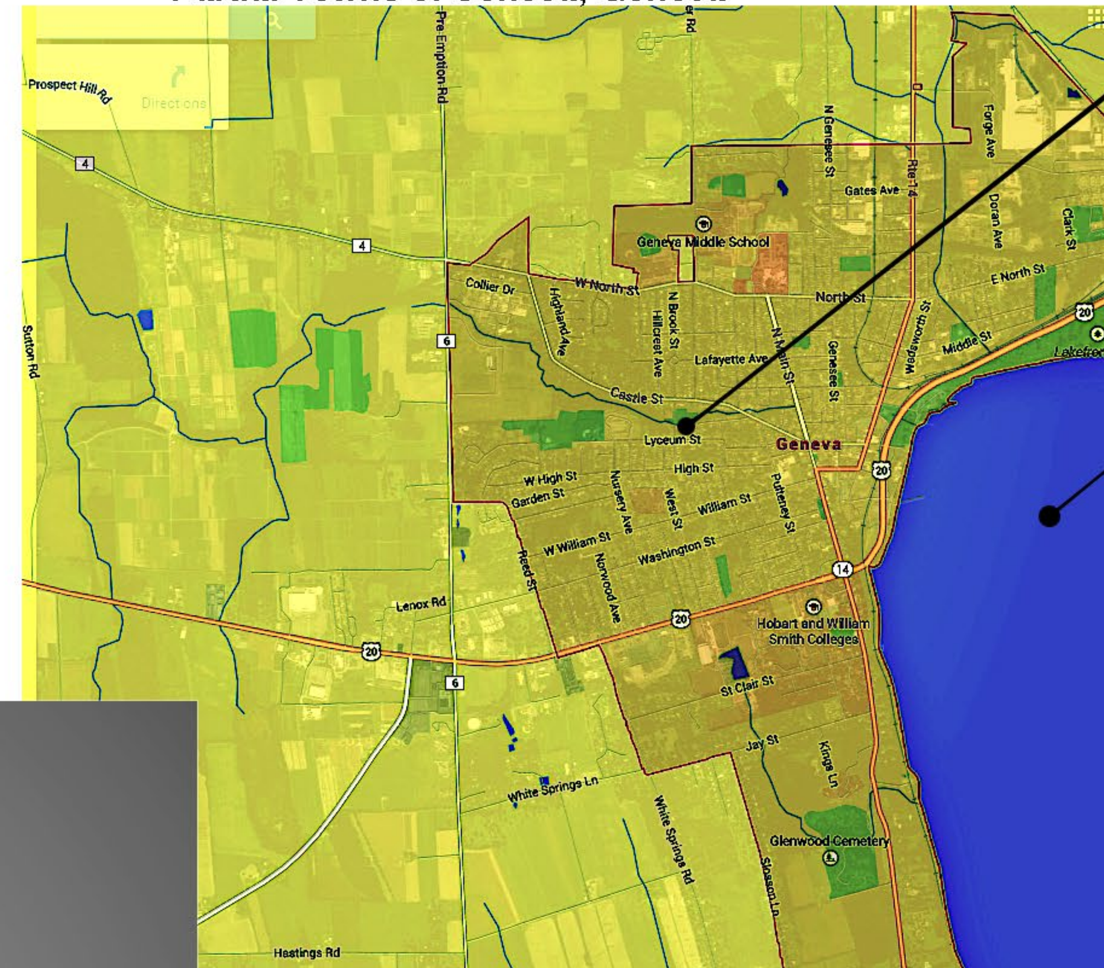
As related to preliminary findings, site selection, and both the case and precedent studies, a schematic level of drawing information is provided in an 11 x 17 format. These drawings are at the architectural scales indicated for site plan and architectural plan. The schematics are the development of building information modeling (BIM) technology in association with the use of the Google Earth Pro program, USGS mapping, rendering, and graphic tools. These drawings are:

- <u>PLAN VIEWS (Figs. 56–58; 61–63); PSYCHROMETRIC CHART (Figure 60);</u>
- <u>ELEVATIONS (Figs. 67-69); SECTIONS (Figs. 70-73);</u>
- <u>RENDERINGS (Figs. 73–81).</u>

<u>It should be noted that the originals for *Figures* 60-82 the associated schematic design materials are in 11 x 17 formatted pages.</u>

Image Courtesy of http://pix.epodunk.com/locatorMaps/ny/NY_728.gif

Partial Towns of Seneca; Geneva



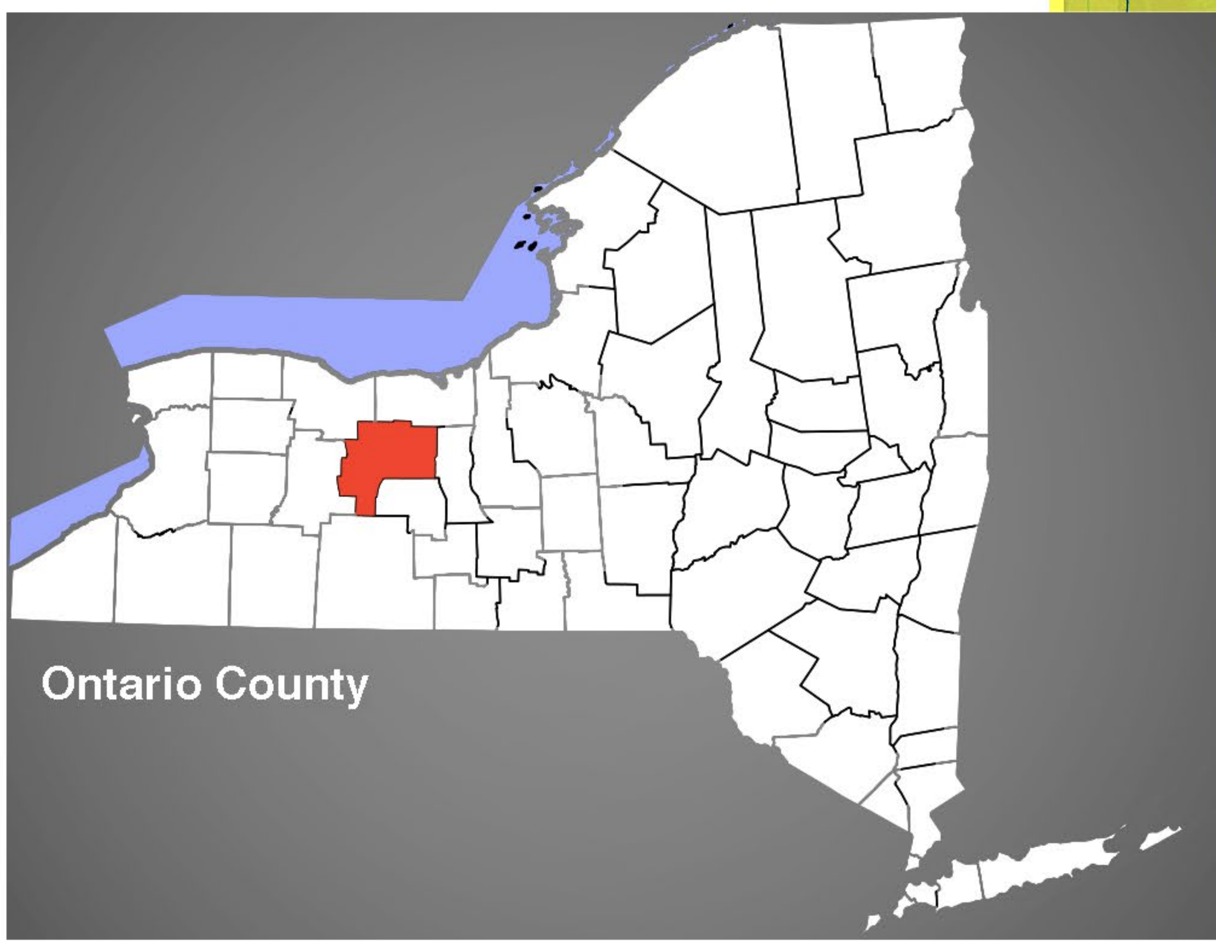


Image Courtesy: https://upload.wikimedia.org/wikipedia/commons/thumb/f/f4/Map_of_New_York_highlighting_Ontario_County.svg/1008px-Map_of_New_York_highlighting_Ontario_County.svg.png

Brook Street Park

Image Courtesy: Google Earth - 2010 data

Figure 56. Site Location Plan.

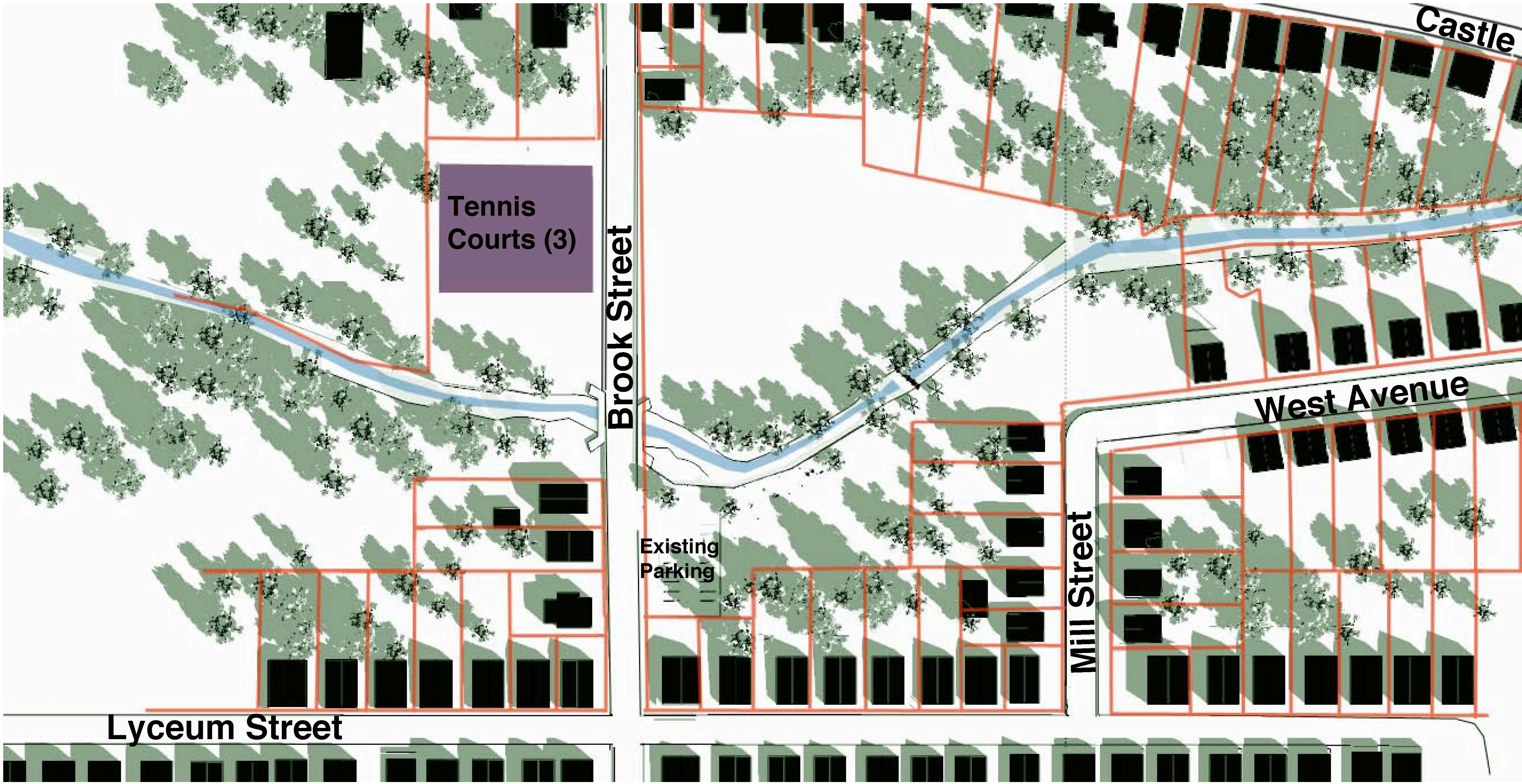


Figure 57. Existing Figure Ground. Drawn by J. Nicholson

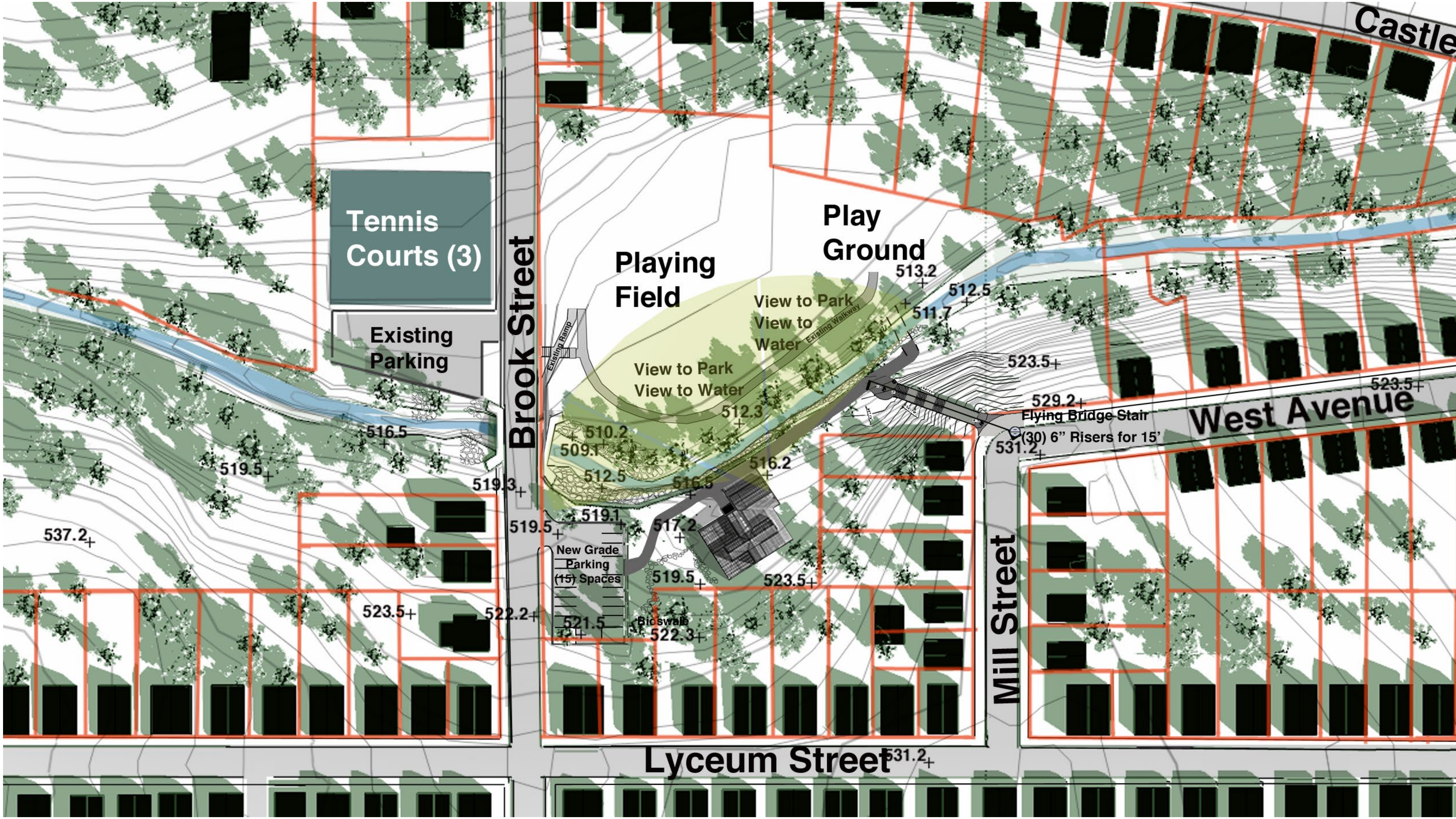


Figure 58. Site Plan. (Enlarged)

Drawn by J. Nicholson

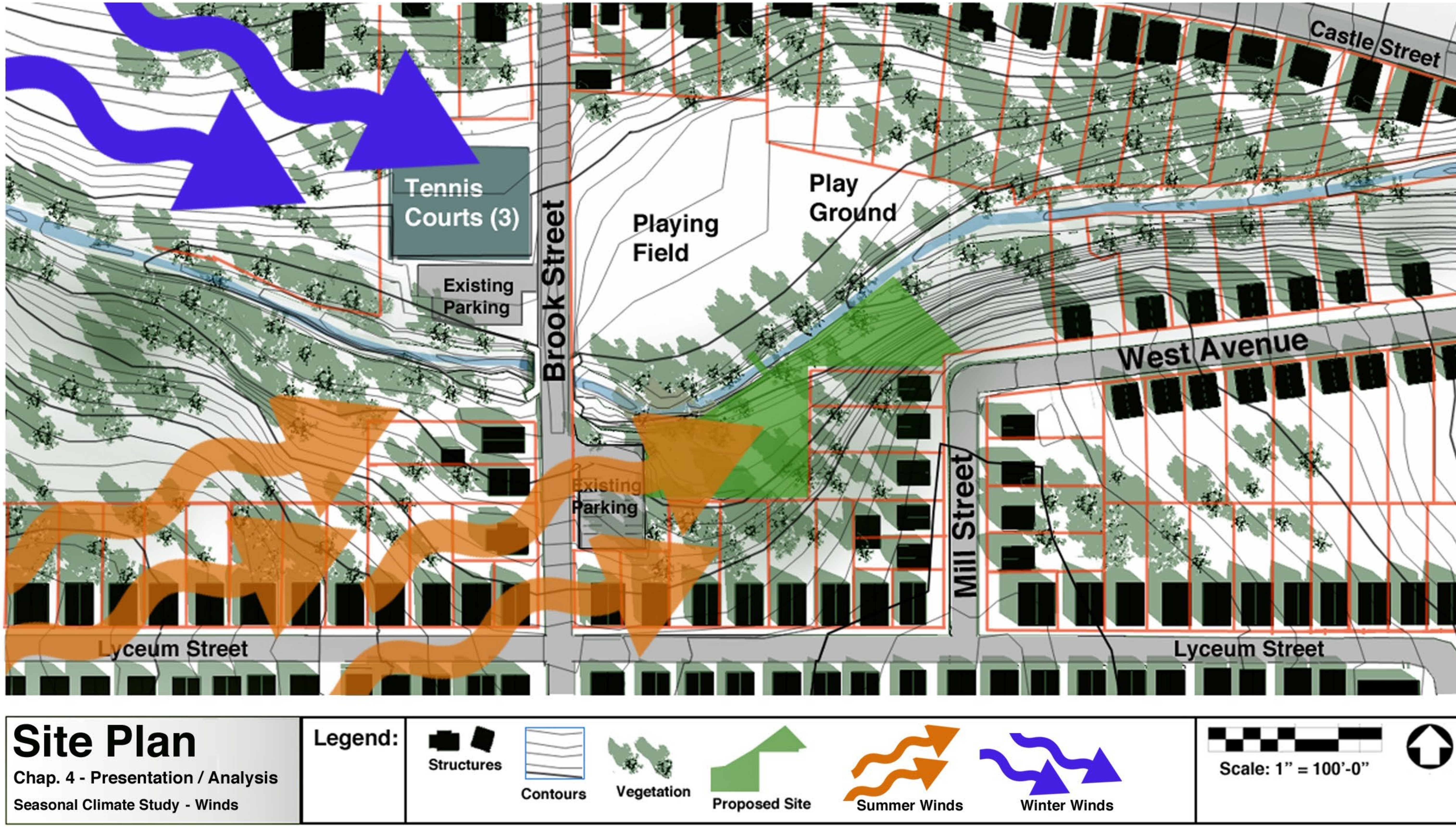


Figure 59. Site Plan BioClimate Studies. Must reference

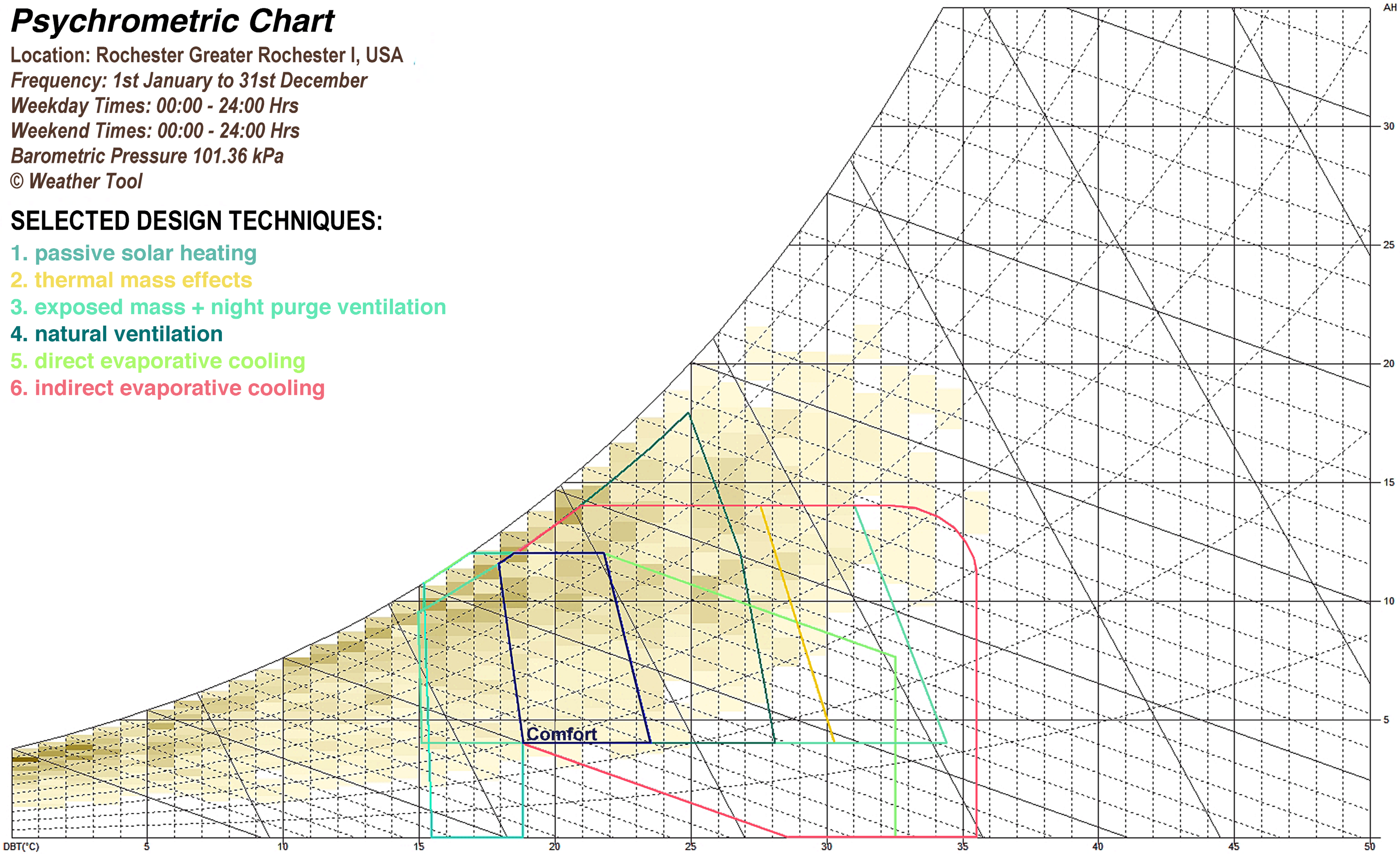
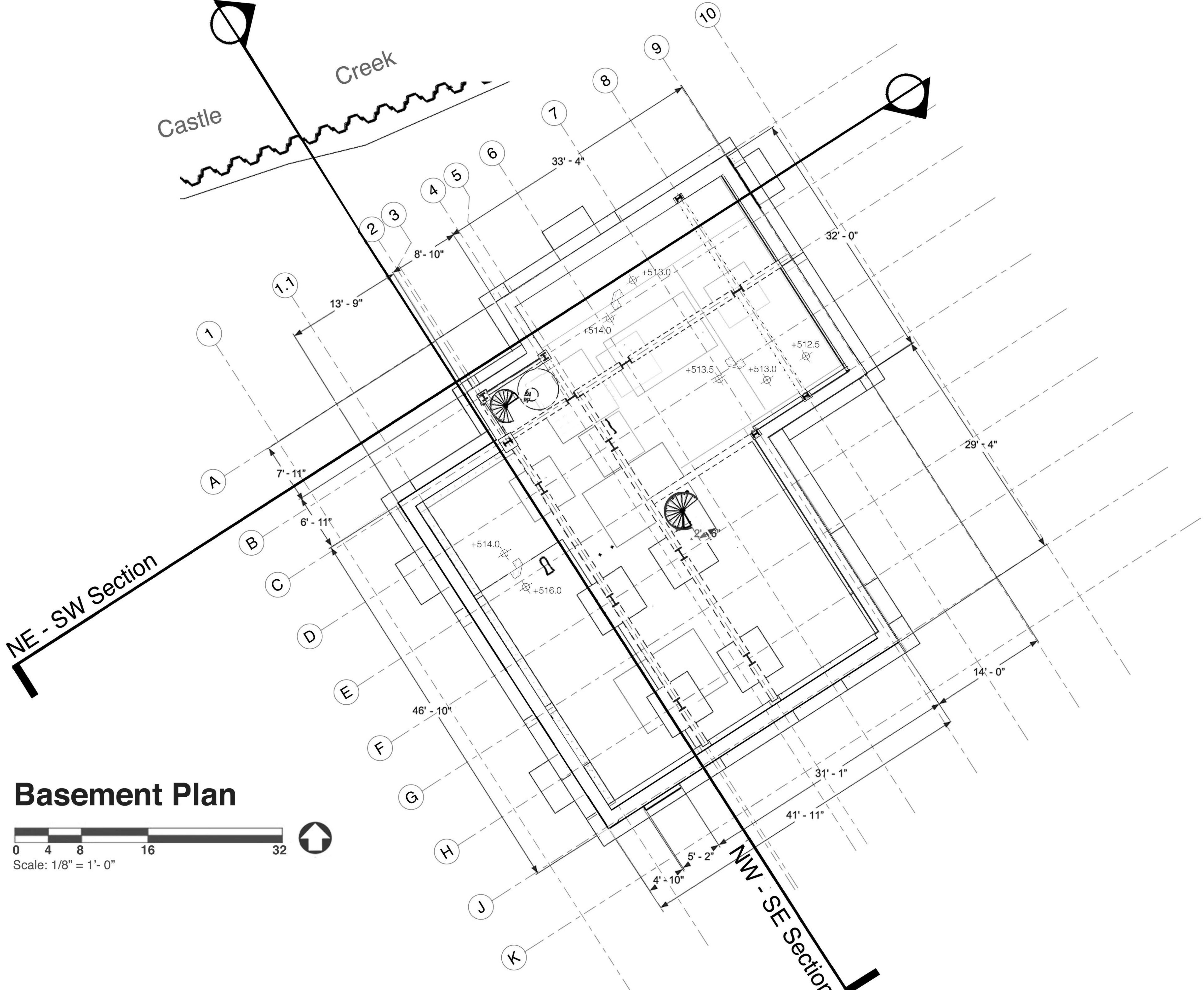


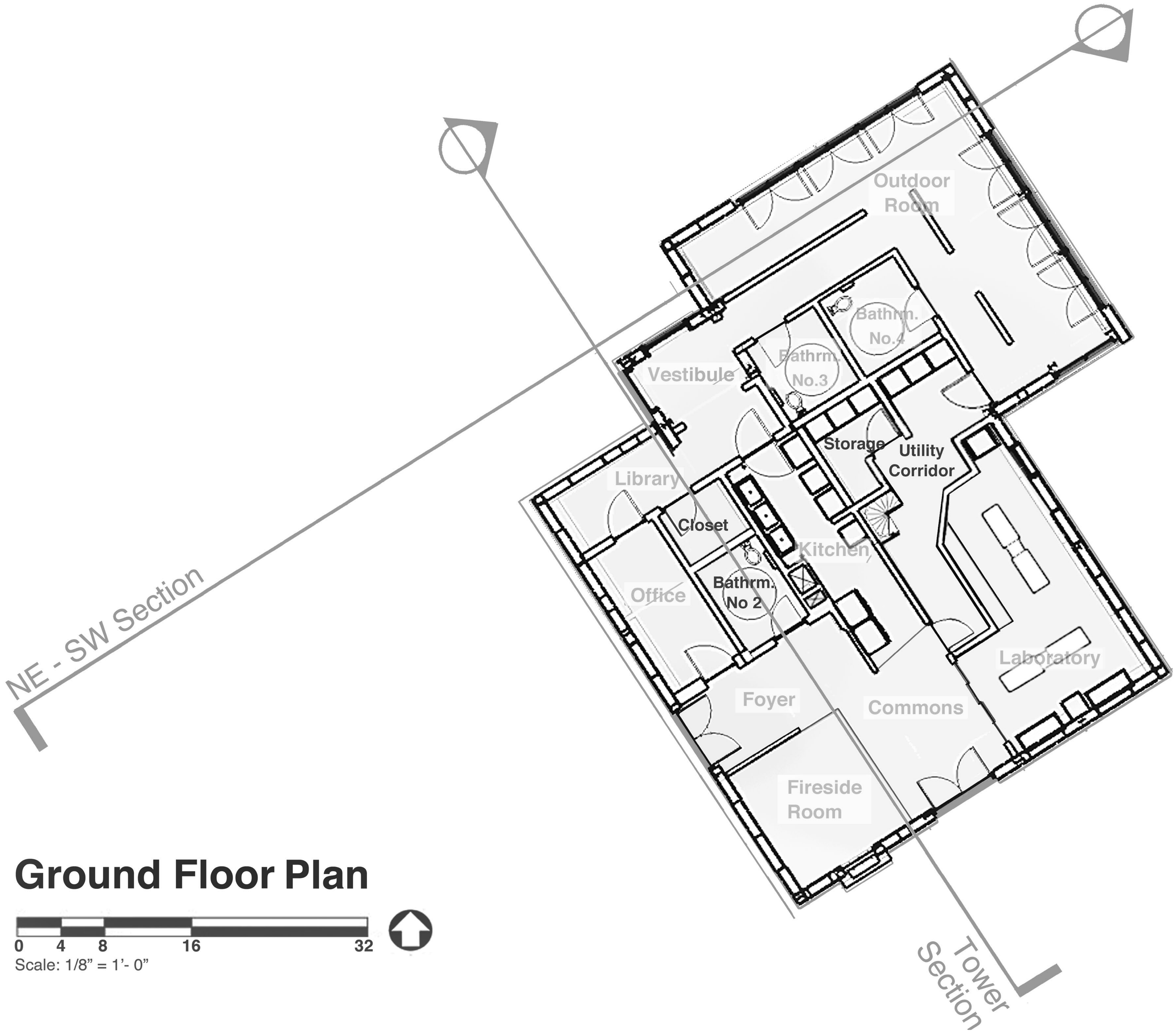
Figure 60. Psychrometric Chart. Description and reference from EcoTect's WeatherTool



Basement Plan

0 4 8 16 32

Scale: 1/8" = 1'- 0"



Ground Floor Plan

0 4 8 16 32

Scale: 1/8" = 1'- 0"

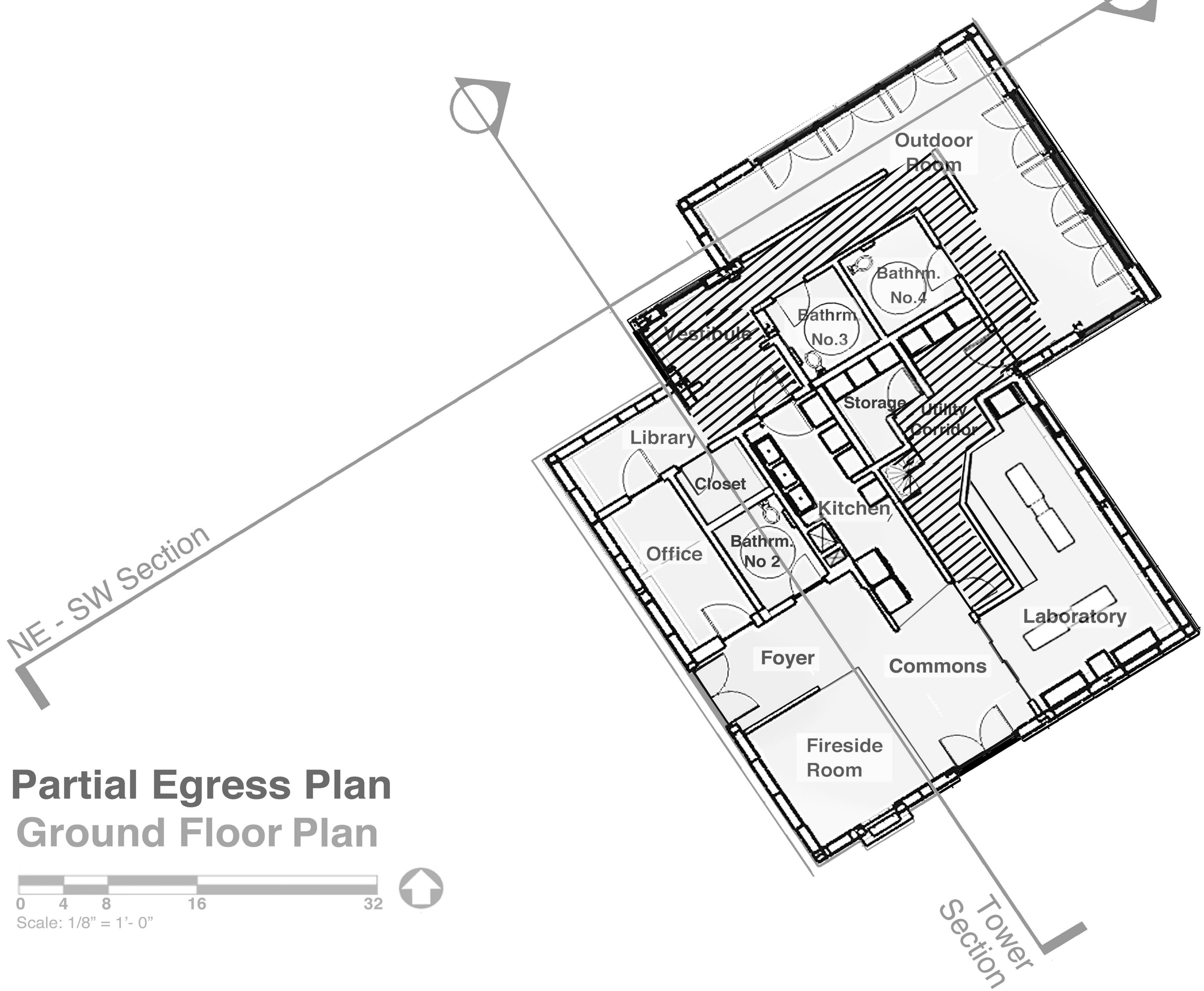


Fig. 63. Ground Level Floor Plan

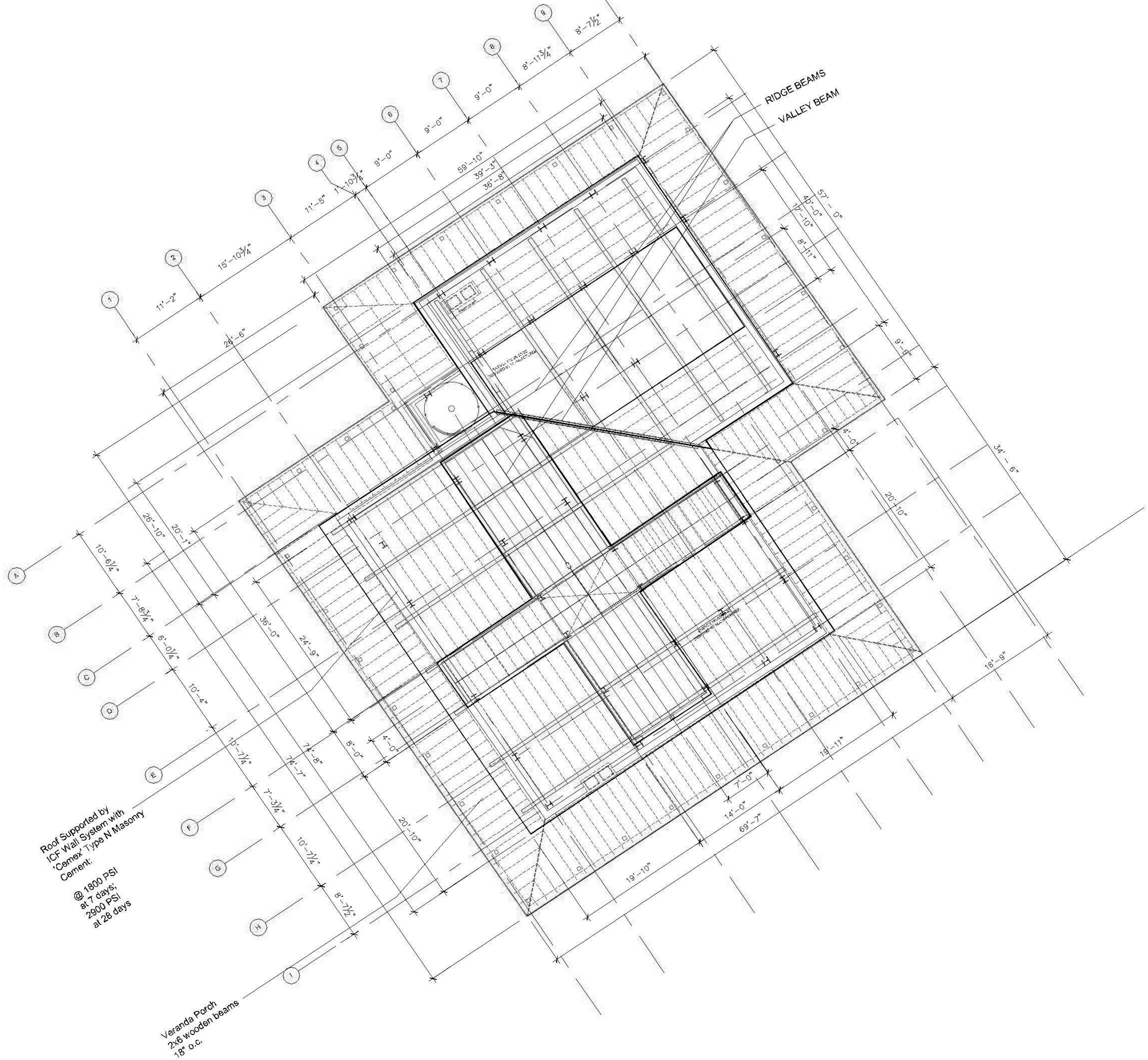
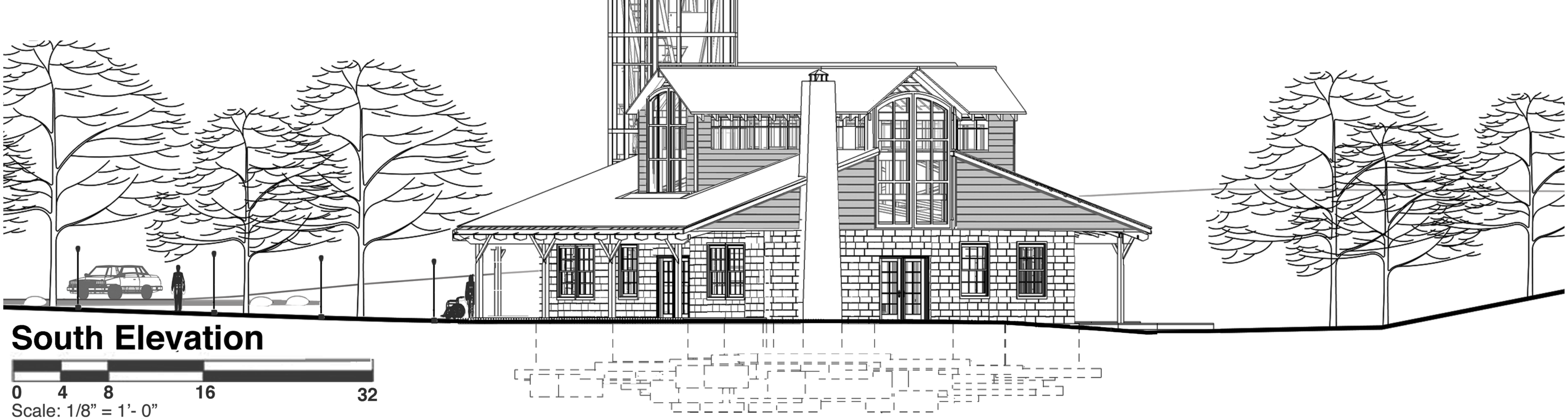


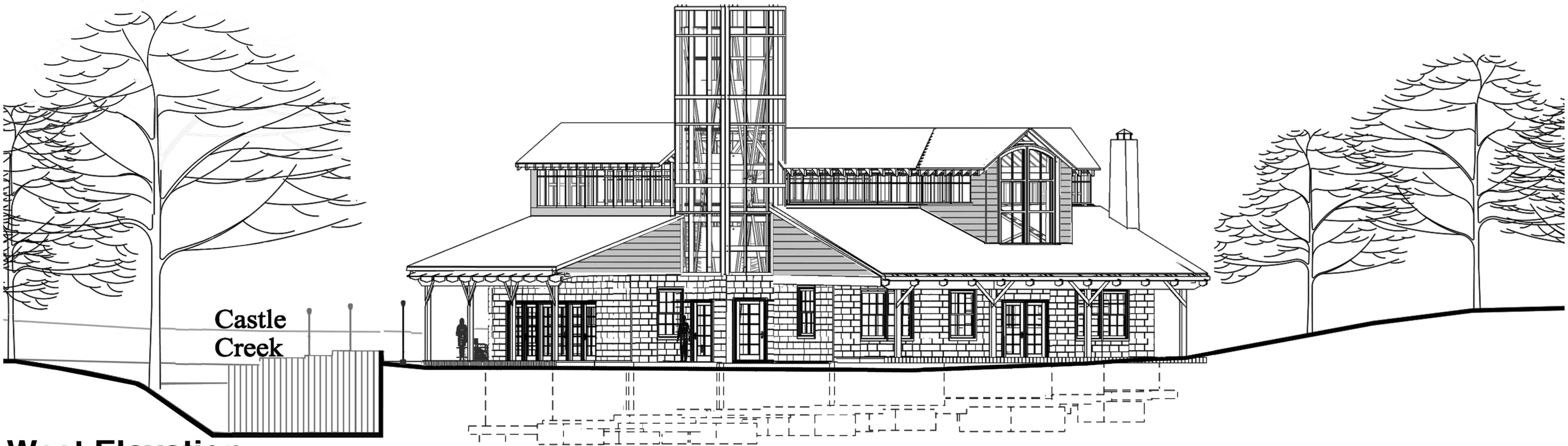
Figure 64. Framing Plan



South Elevation

0 4 8 16 32

Scale: 1/8” = 1’- 0”

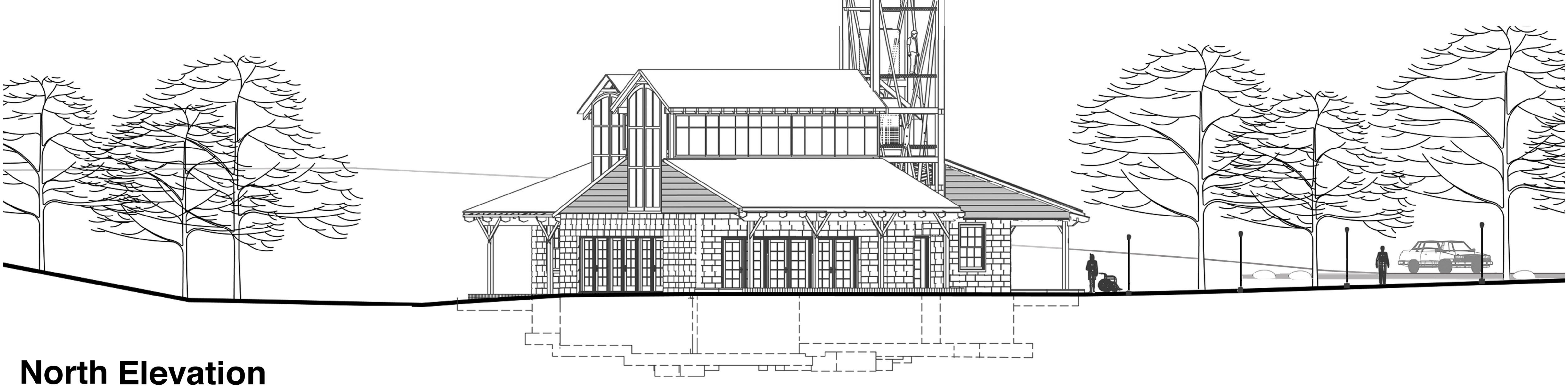


West Elevation

0 4 8 16 32

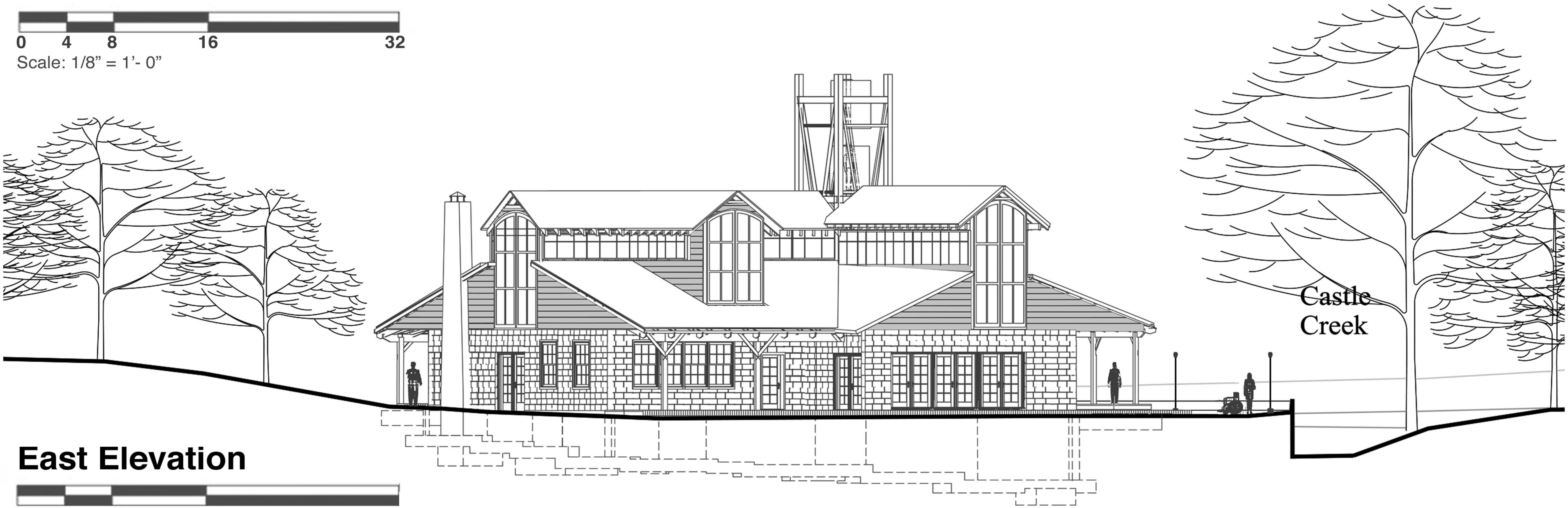
Scale: 1/8” = 1’- 0”

Figure 65. South Elevation West Elevation



North Elevation

0 4 8 16 32
Scale: 1/8" = 1'- 0"



East Elevation

0 4 8 16 32
Scale: 1/8" = 1'- 0"

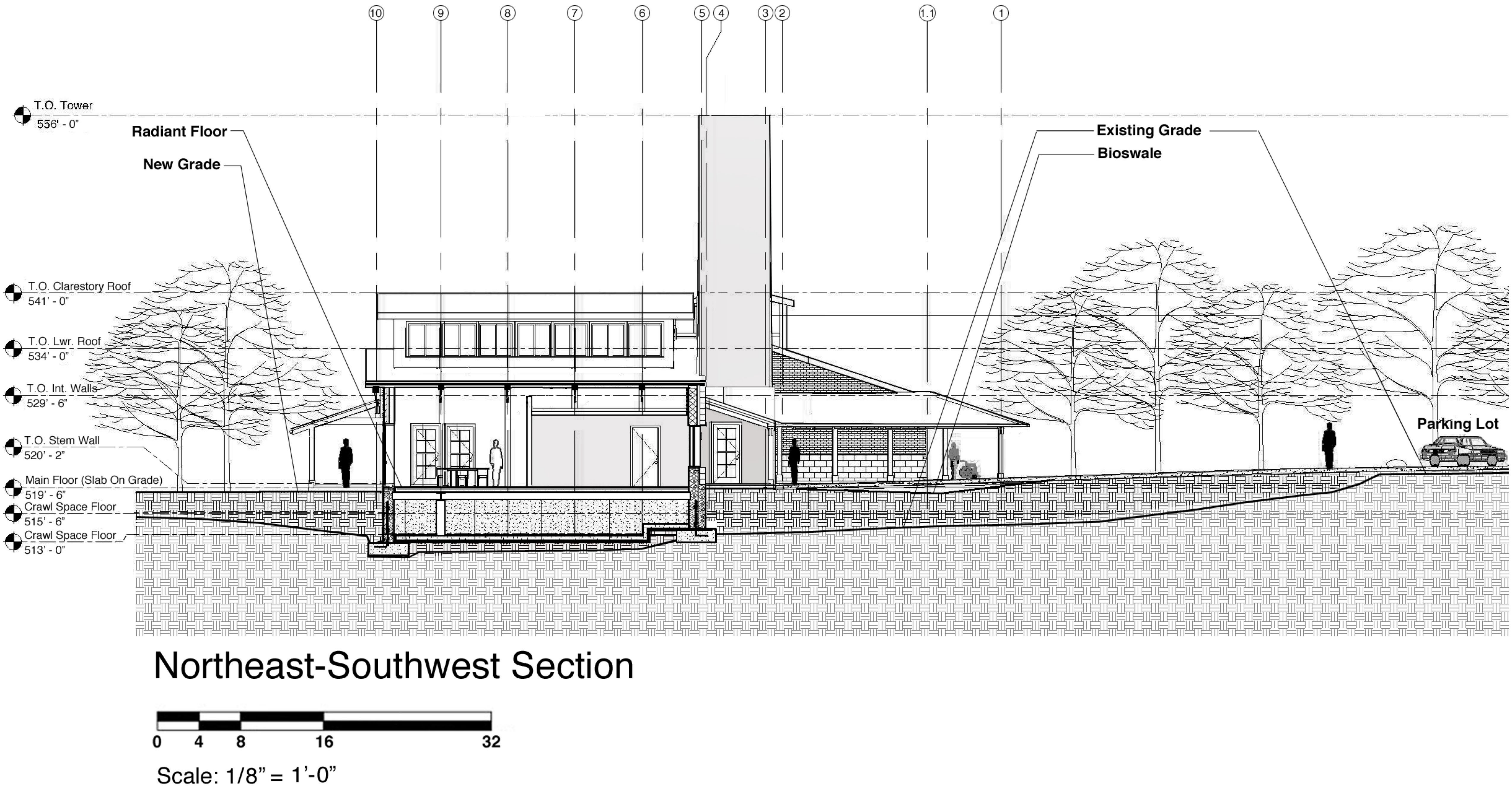


Figure 67. Building Section along a NE-SW cut looking into Outdoor Room. Drawn by J. Nicholson

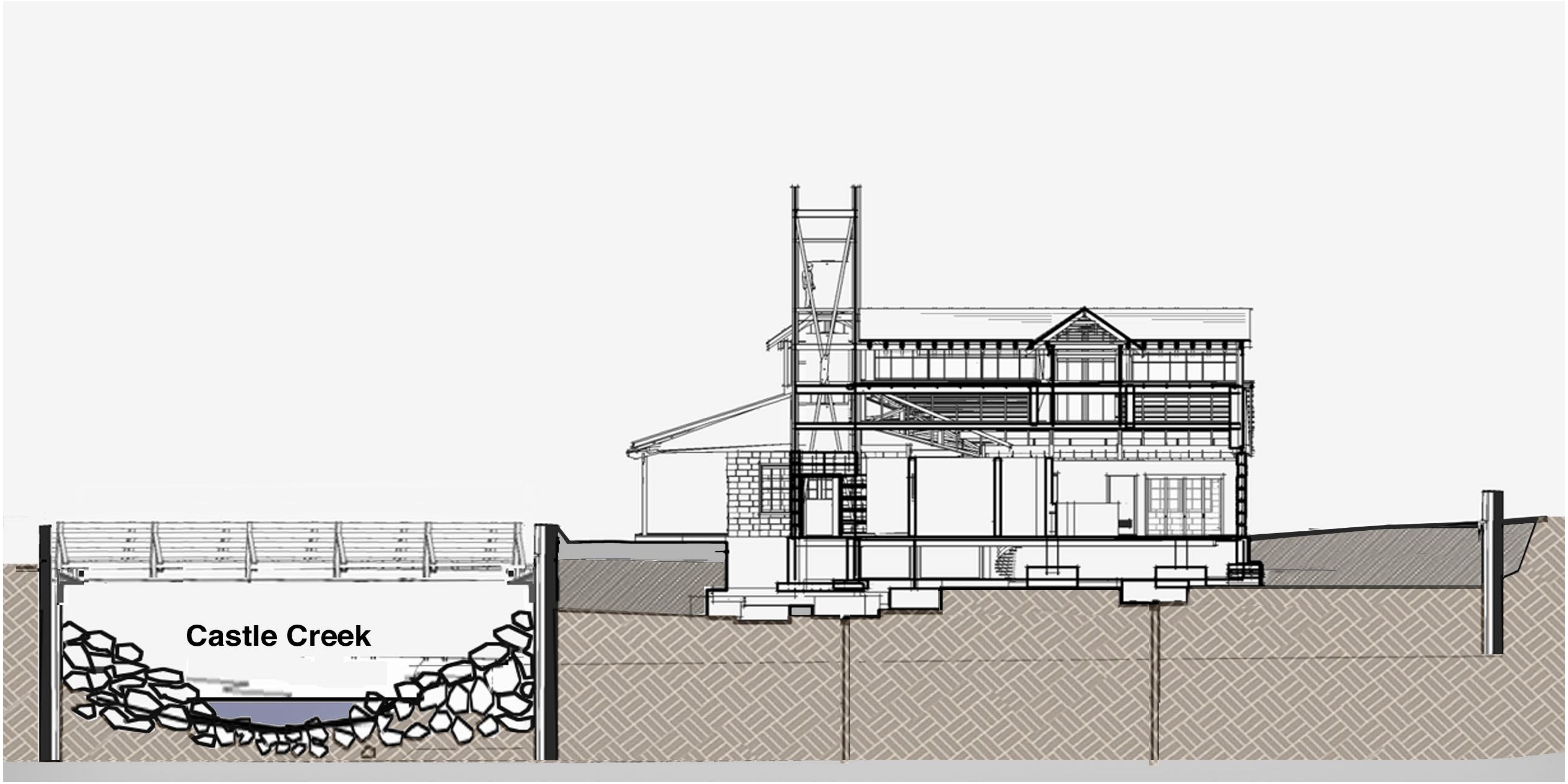
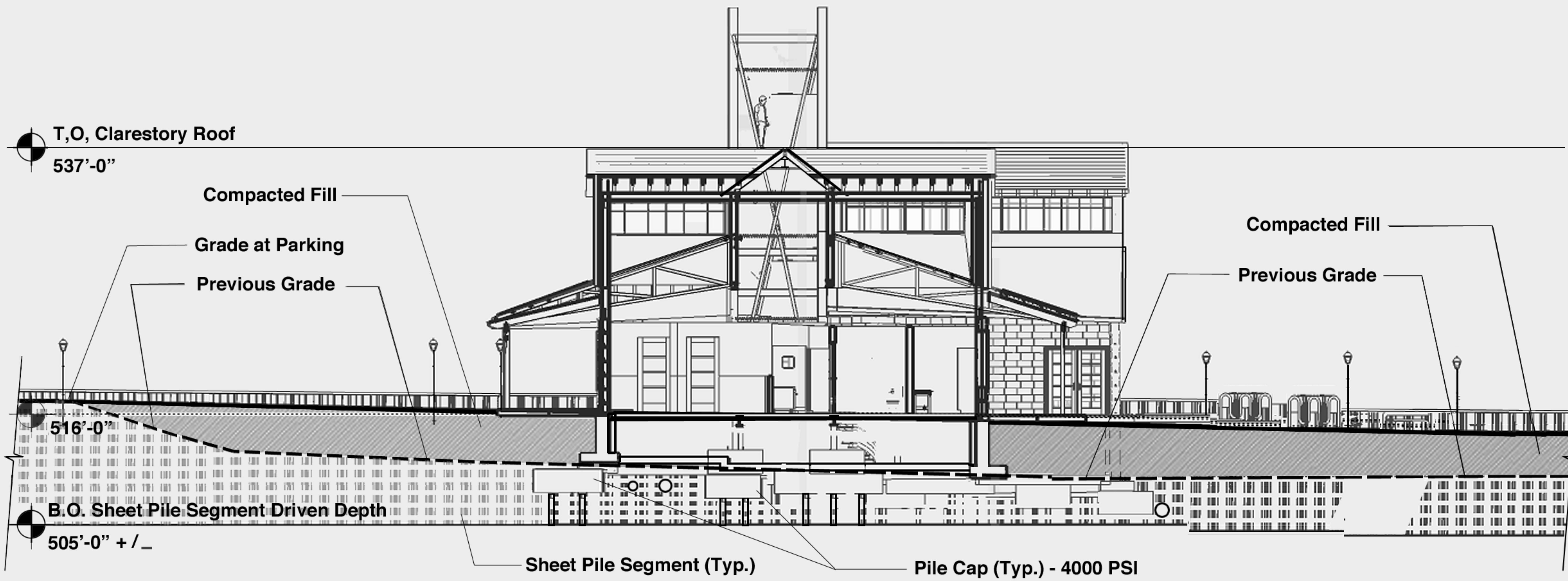


Figure 68. Building Section along NW-SE cut (showing Footbridge Beyond). Drawn by J. Nicholson



Cutaway Section @ Sheet Pile Depth (N.T.S.)

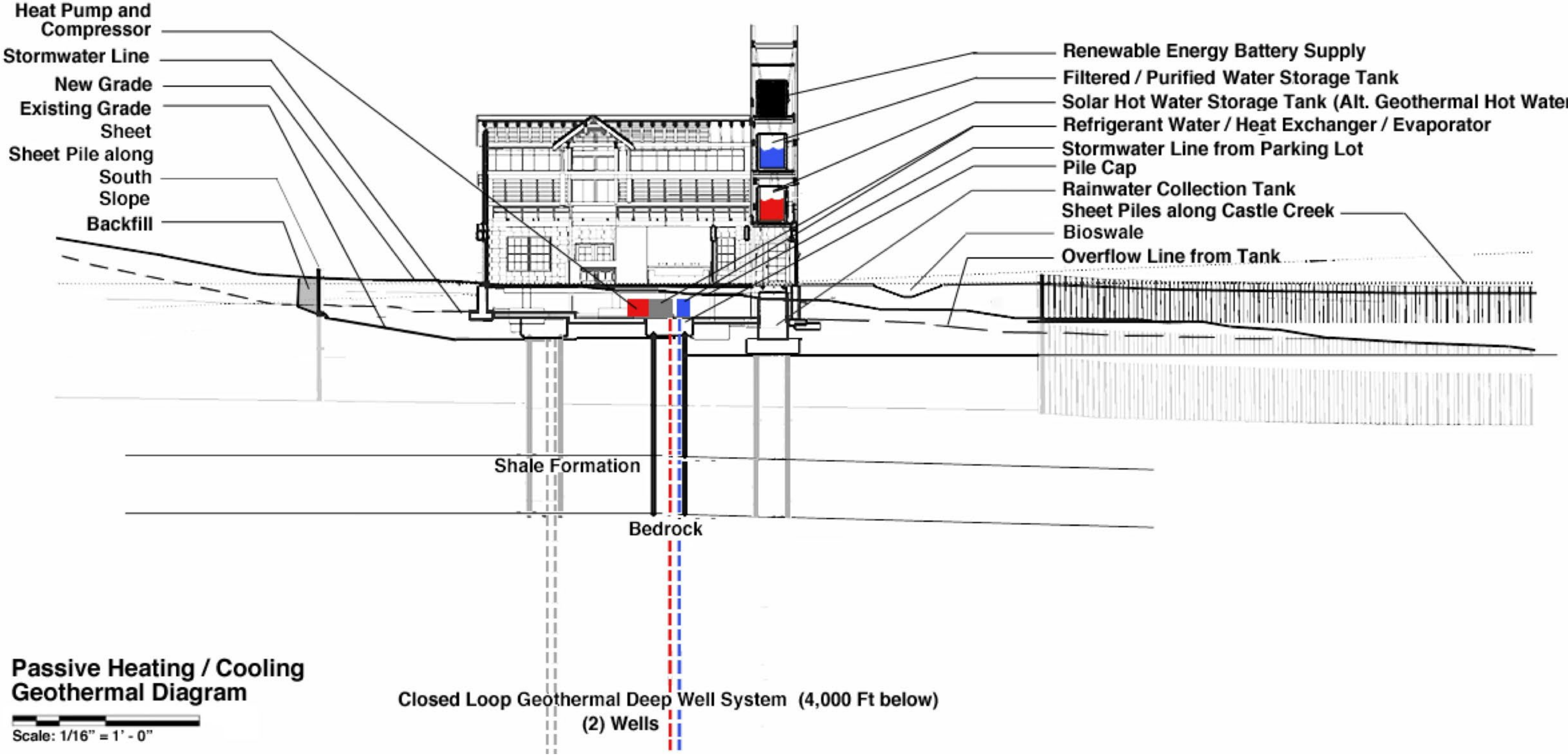


Figure 70. Theoretical passive design diagram. Drawn by J. Nicholson

Figure 71. Interior Perspective, Entry at Commons Room. Rendering by J. Nicholson

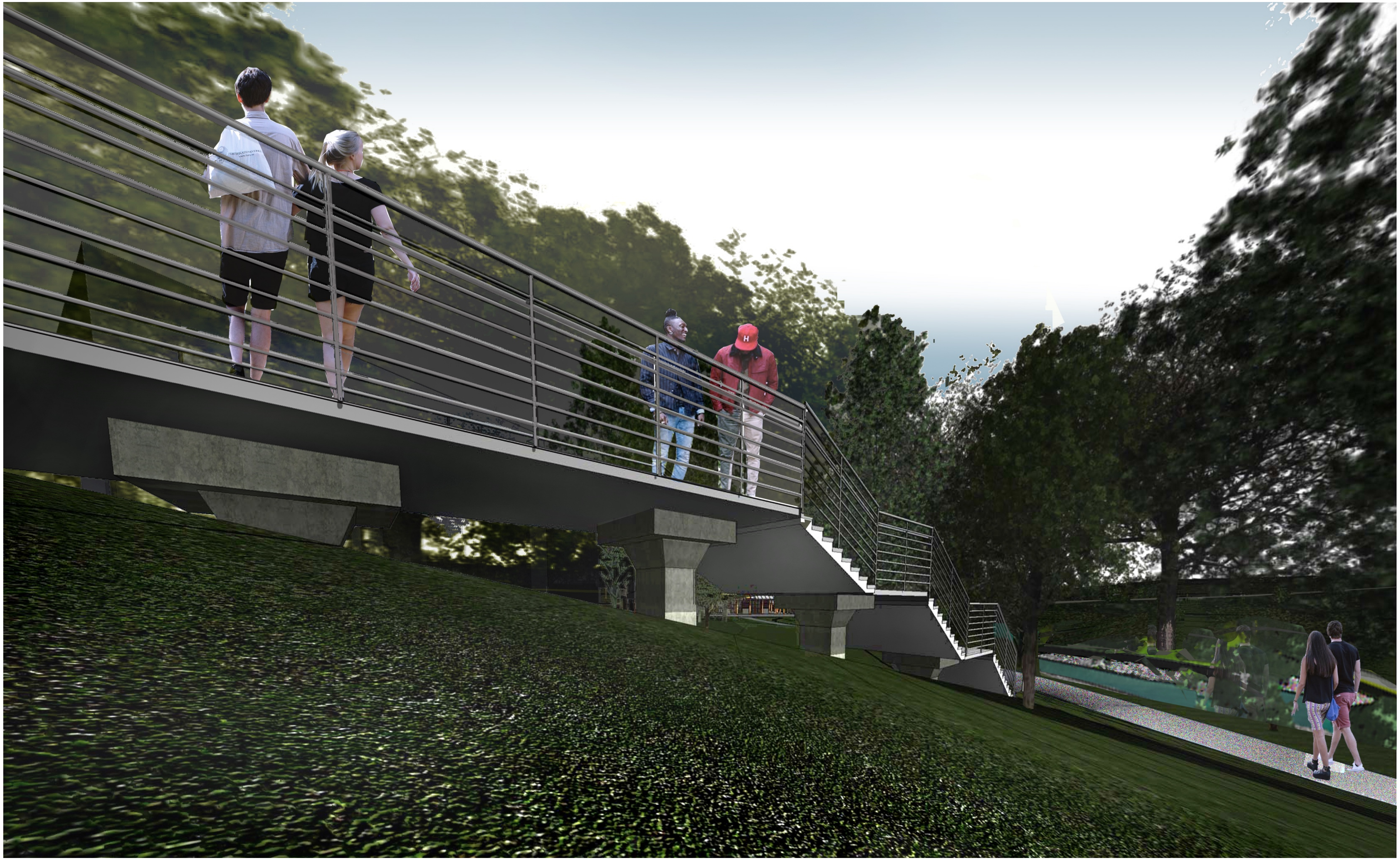


Figure. 72. “Flying Bridge” stair from West Avenue/Mill Street. Rendering by J. Nicholson

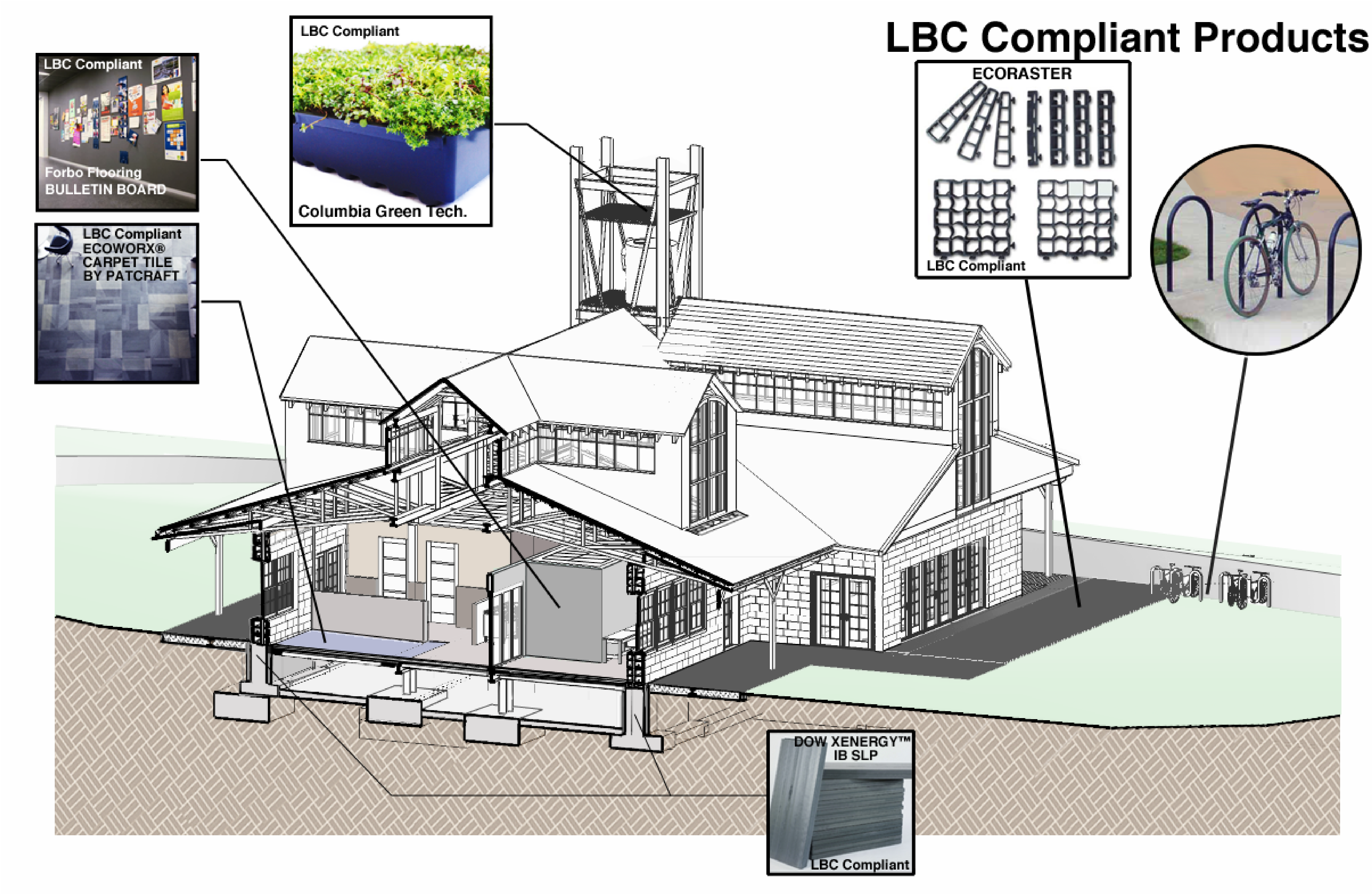


Figure 73. Sample selection of LBI Living Building compliant materials. Composited by J. Nicholson

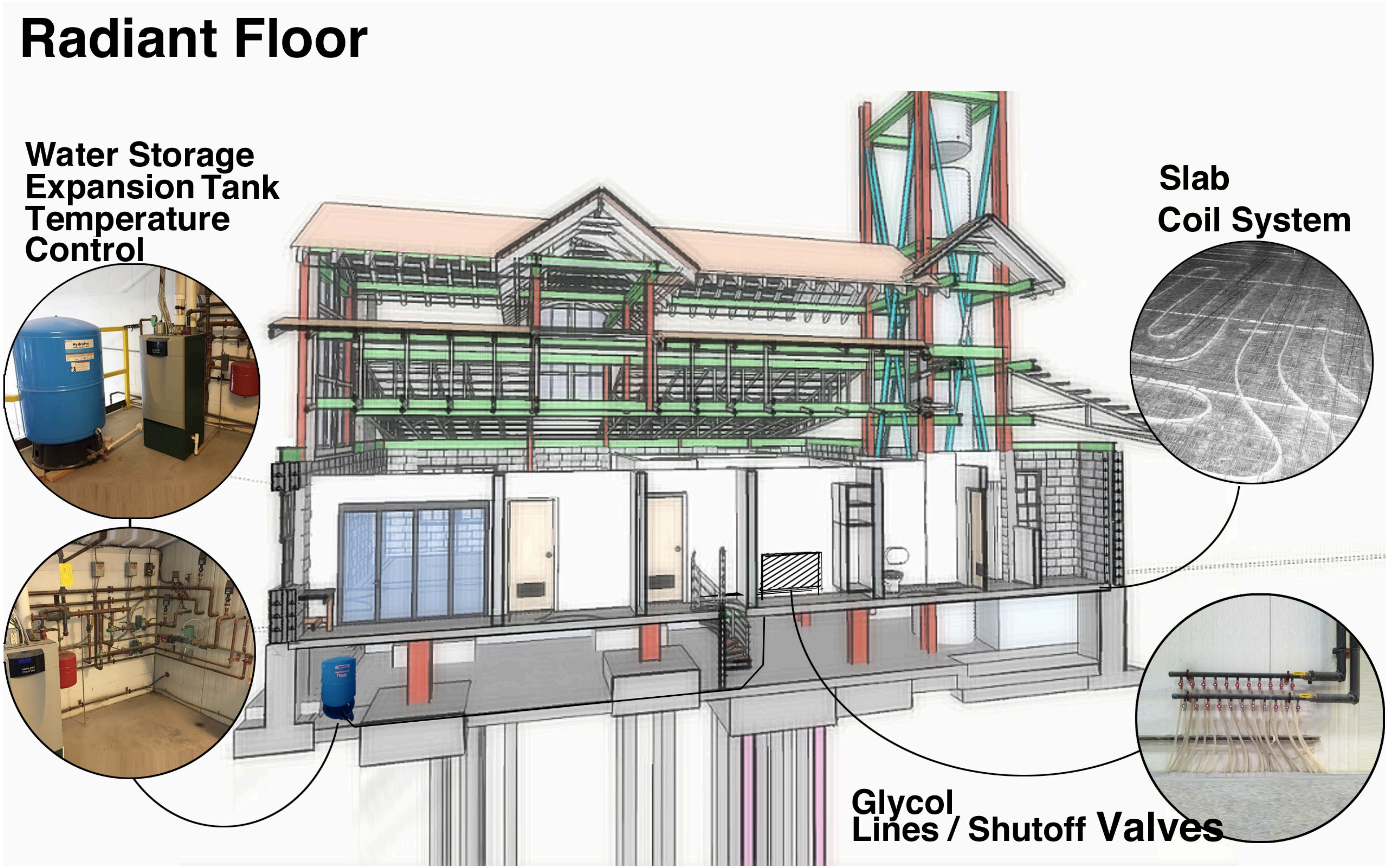


Figure 74. Radiant floor heating and cooling – 3D schematic diagram Created by J. Nicholson

Figure 75. Interior rendering classroom / laboratory - Rendering Created by J. Nicholson

Figure 76. Exterior perspective, aerial view looking west - Rendering Created by J. Nicholson

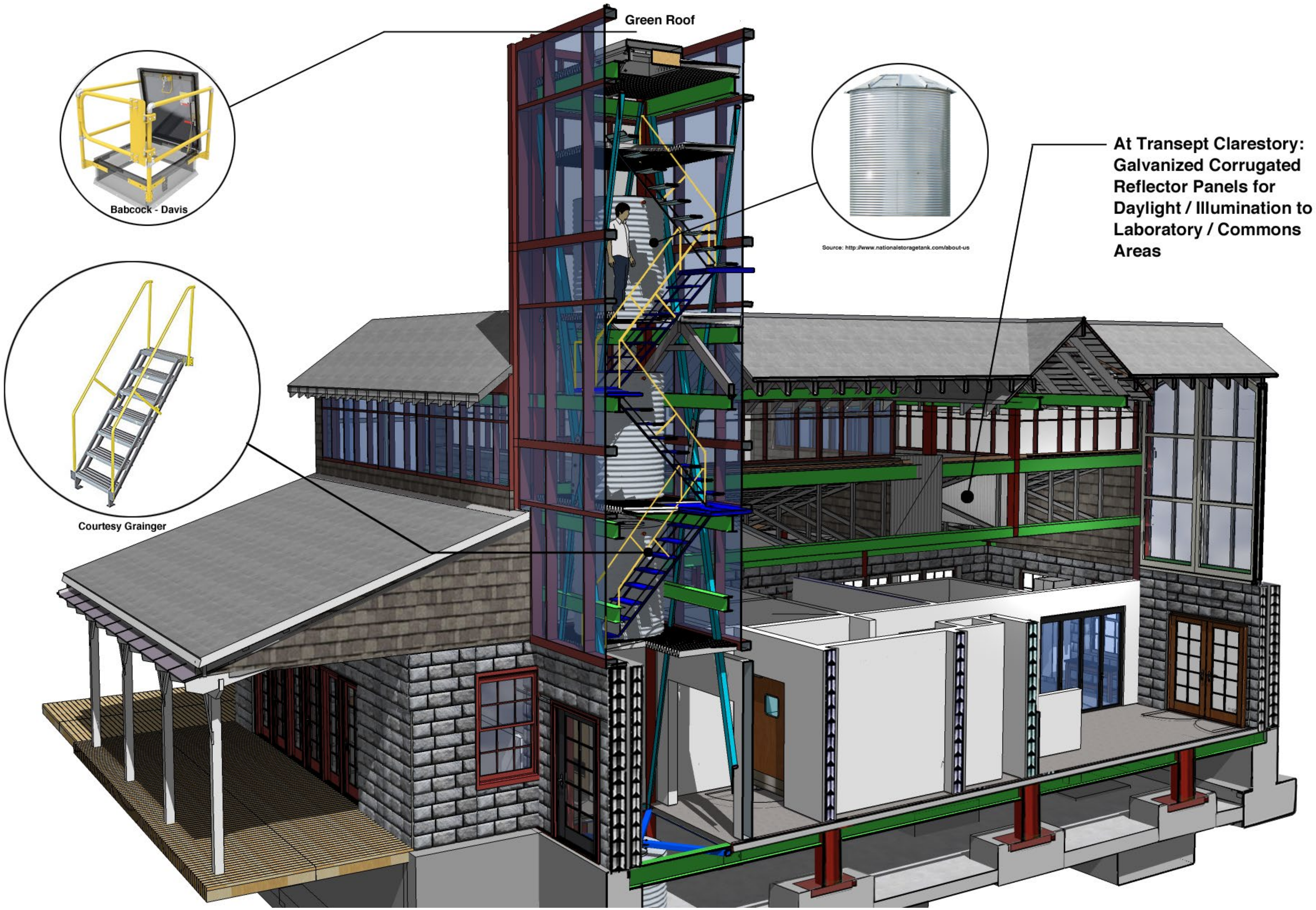


Figure 77. Mechanical / water tower – Rendering by J. Nicholson

Figure 78. Exterior perspective, view looking west - Rendering Created by J. Nicholson

Figure 79. Interior perspective beneath NE axis clerestory (view through kitchen). Rendering by J. Nicholson

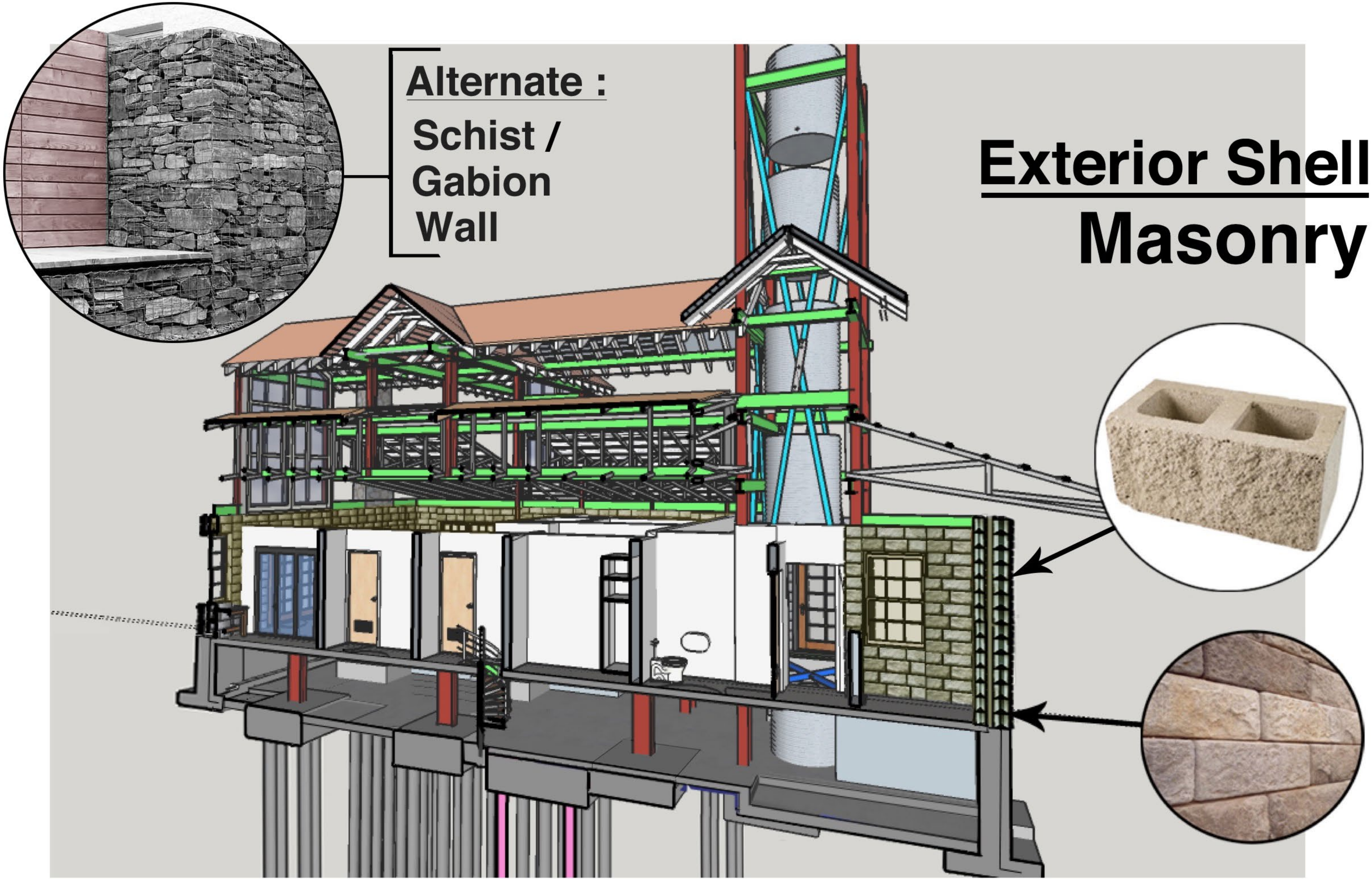


Figure 80. 3D Wall section – Rendering by J. Nicholson

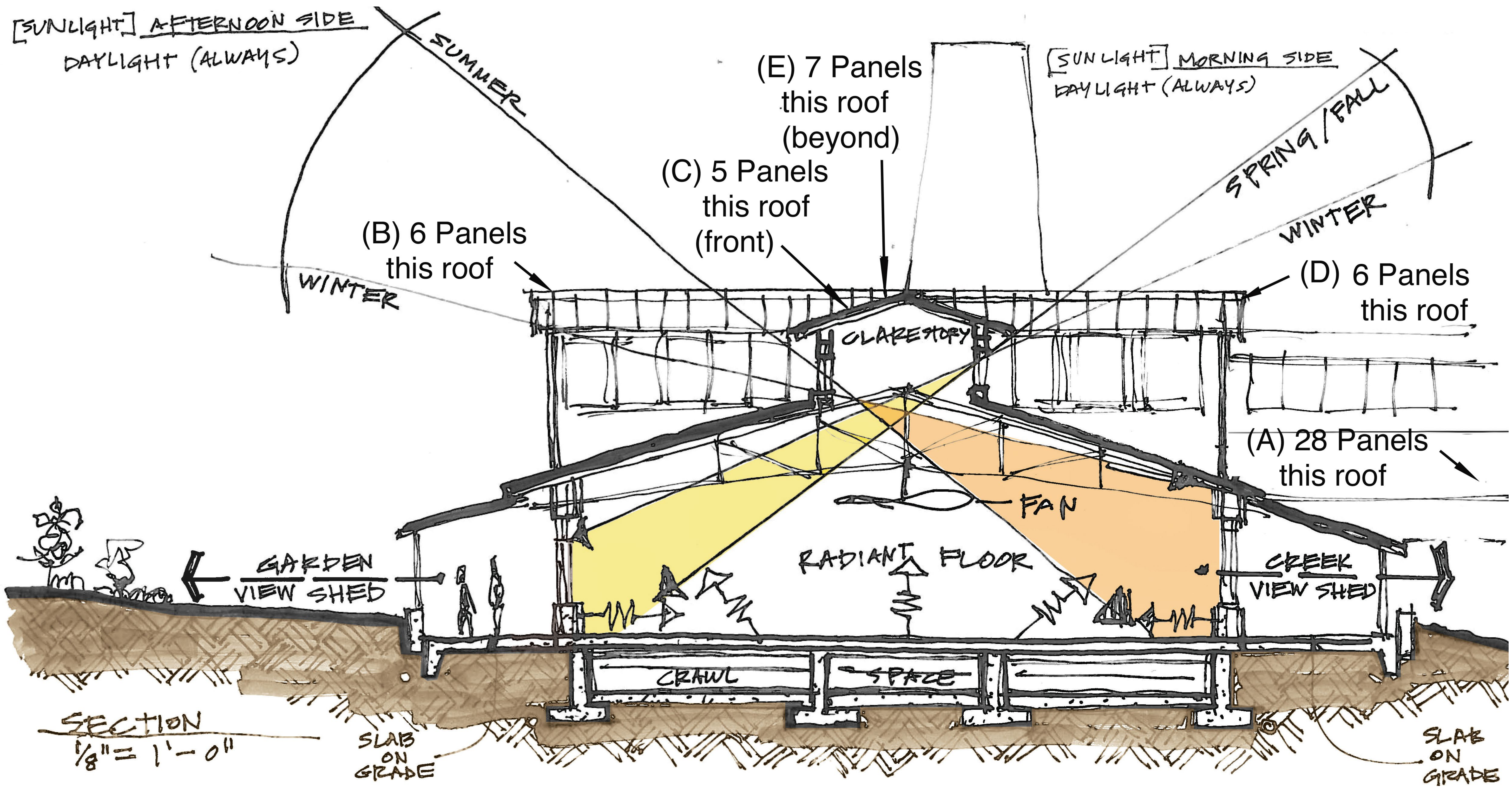
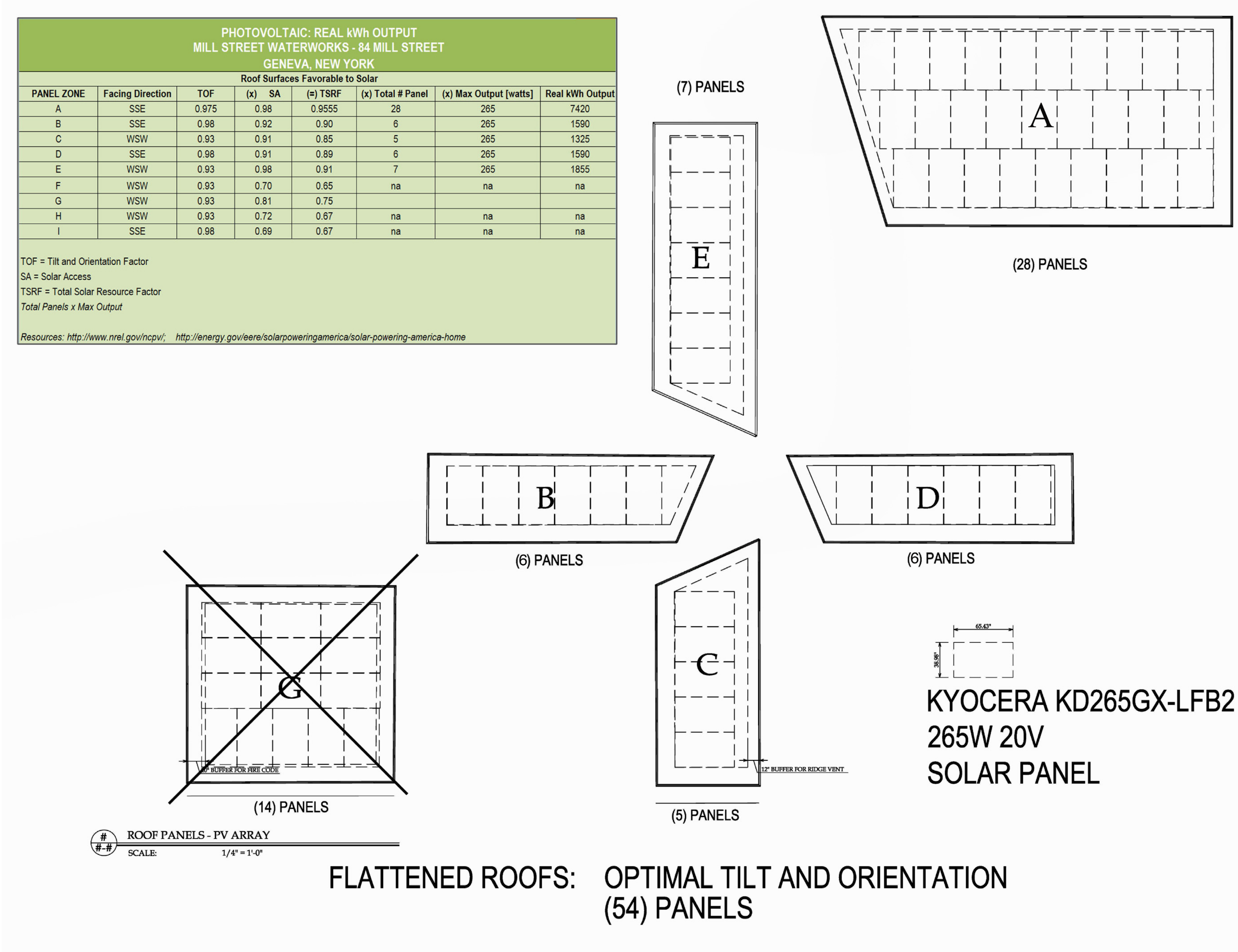


Figure 81. Sketch showing SSW and NNE section elevation with typical daylighting and roof provisions for Solar Arrays – by J. Nicholson. 2015.



PHOTOVOLTAIC: REAL kWh OUTPUT
MILL STREET WATERWORKS - 84 MILL STREET
GENEVA, NEW YORK

Roof Surfaces Favorable to Solar

PANEL ZONE	Facing Direction	TOF	(x) SA	(=) TSRF	(x) Total # Panel	(x) Max Output [watts]	Real kWh Output
A	SSE	0.975	0.98	0.9555	28	265	7420
B	SSE	0.98	0.92	0.90	6	265	1590
C	WSW	0.93	0.91	0.85	5	265	1325
D	SSE	0.98	0.91	0.89	6	265	1590
E	WSW	0.93	0.98	0.91	7	265	1855
F	WSW	0.93	0.70	0.65	na	na	na
G	WSW	0.93	0.81	0.75			
H	WSW	0.93	0.72	0.67	na	na	na
I	SSE	0.98	0.69	0.67	na	na	na

TOF = Tilt and Orientation Factor
SA = Solar Access
TSRF = Total Solar Resource Factor
Total Panels x Max Output

Resources: http://www.nrel.gov/ncpv/; http://energy.gov/eere/solarpoweringamerica/solar-powering-america-home

Figure 82. Alternate on-site photovoltaic array – roof layout and tilt orientation factor analysis – Information compiled by J. Nicholson, with J. Reynolds. 2015.

The Design Criteria

General Requirements - Overview

The CUED project is located on a site that provides a tranquil connection to an urban stream, in a naturally forested environment within a city. The proximity of this site to the spring-fed brook (Castle Creek) shall be protected and addressed in the daily functions of the building. The project is intended for the City of Geneva, NY, a community dedicated to environmental dialogue and sustainability efforts within practical urban design practices.

The floor plan is programmed orthogonally, at a prominent bend of the creek. It is envisioned within a naturally created outdoor space that is surrounded by moderate slopes down to the creek, east and south of the location. The orientation of the building is facilitated to maximize daylight use. The proposed building's subbase will be raised, above the existing grade, to allow for greater roof exposure to sunlight, and for views to the creek and park grounds to the north. The site grounds are to accommodate pathways for pedestrian access and enhancements shall be made within this landscaping effort. The construction of the facility will result in a gross 3,127 sq.ft. structure, plus a 2,800 sq.ft basement. The deck levels in the mechanical tower total 500 sq.ft. The basement houses mechanical functions for the sustainable renewable amenities provided such as rainwater capturing and filtration, geothermal functions, and partial potable water storage. The ground floor is comprised of a public pavilion unit, commercial kitchen, dining/common room with southern exposure, a laboratory, fire-side/sitting room, office, small library, ADA compliant bathrooms, and ample storage space.

The grounds situate terraced gardens, pathways to a bridge, eastern perimeter park steps, and parking (tying into an existing lot). To generate a synthesis between nearby neighborhood residents, main rooms are accessed from the ground level and have a semi-private entry with windows into all spaces, several rooms have exposure along a veranda. The main entry vestibule at the northwest corner is expressed underneath a tall inviting, steel-framed tower. This feature houses water tanks to service the building's sinks and toilets. A veranda porch, with exposure to the terraced grounds, provides shelter space and additional interactive space within the public park. In an effort to create a sustainable environment with unprecedented pedestrian foot traffic as well as several bio-retention zones, the grounds making up the CUED site are properly balanced and retained by several feet of sheet pile and large rip-rap boulders along the southern edge of the creek. This excavation and extracted earth, created during the laying of new sheet piles or cutting along the creek's edge are to be reused as fill, compacted fill, or topsoil. It shall be screened and recycled for the top 3' of planting medium for CUED's gardens.

General Requirements - Building Access

At the partial perimeter, a covered veranda with a spacious porch is accessible from both the Mill Street/West Ave. step entrance, and the Brook Street parking lot path entrance. It is also accessible from the newly installed Brook Street Park footbridge over Castle Creek. Brook Street is a two-lane wide street that is steep at either end, with gradients of approximately 3.5%, near the intersection at Lyceum Street to the south, and the intersection with Castle Street to the north. The building will connect to all city sidewalks. The finish floor elevation of the building will be set at an elevation of 519'- 6" above sea level to allow positive drainage away from the building. Due to the southwestern perimeter of the site sloping at a 2.8% grade, it will be wise to provide combination basement/retaining walls to support the earth embankment. The southwest grounds of the building will have terraced landscape walls to support fill slopes and maintain access to the building. Sixteen parking stalls will be refurbished for this project and two ADA parking spaces will be created. All new spots will be located on the existing asphalt pad that will be made a more semi-pervious surface with a sustainable semi-permeable concrete to allow for percolation into the terraces. A 40’ long P-Stone walk path will lay between the parking and the main vestibule entrance. The slope of the path is less than .5%. The compacted loose stone path will require a concrete retaining strip of at least 24” deep on the north side in order to prevent erosion of the P-Stone.

Existing Conditions – Site Overview

The site is spatially compact and somewhat narrow within its grounds. After grading and executing site balance for the foundation work, construction vehicles will have better access to the site. The site was recommended by a Geneva city planner as the host of this schematic design development. A precedent project was proposed here in 2011, using a connectivity study with some buildings on the same grounds. This was done by In.Site: Architecture and directed by Principal, Rick Hauser, AIA, of Perry, NY. Some features of the In.Site’s ADA walkway were realized as part of their 2011 proposal. These are now in place and provide suitable further connectivity to CUED’s site design proposal. Prior to this, a 2002 new culvert was installed under Brook Street and a small parking area was created using the spoils of that excavation. A stair access and bridge were part of one option of the In.Site proposal but were not built. Space is used but is not “softly” integrated into the environment.

A comprehensive site plan (Figure 61) shows a full large scale of the neighborhood, closely related to this design. This includes the 16 households surveyed and the utilization of the 2013 USGS Topography, acquired to develop the plan was used. This project property is owned by the City of Geneva. A 2013 USGS Survey was converted to BIM and CAD information in 2015 to augment this schematic site narrative. The proposed new Center for Urban Ecological Dialectics is to be along the southern portion of the boundary of Brook St. Park, between Mill St. (to the east), Lyceum St. (to the south), Brook St. (to the west), and Castle Creek (to the north). It is zoned as (X) for Open Space in the Planning/Zoning District map (City of Geneva, 2015). All four of the major streets (West Ave., Mill St., Lyceum St., and Brook St.) are connected to this site parcel and are paved with sidewalks as access circulation. The project site is surrounded by Residential (R1) Single Family Residences. The planned facility is to be one story with a three-level storage tower. The steel framed structure shall be on a concrete foundation, constructed in three phases, with the pilings, foundation work, site retaining walls, and water tower structure as the first. The building's superstructure will be the second phase, with the building ground's footbridge, grand stair, and landscaping as the final phase.

Since the planned facility must follow a criteria, the following list is adapted from a particular construction formatting language known as Uniformat. It is broken down as the following:

Uniformat II Construction Standard used for CUED classification (all that apply)

A. SUBSTRUCTURE

   Foundations:(Standard Foundations, Special Foundations, Slab-on-Grade)

   Basement Construction: (Basement Excavation, Basement Walls)

B. SHELL

   Superstructure: (Floor Construction, Roof Construction)

   Exterior Enclosure: (Exterior Walls, Exterior Windows, Exterior Doors)

   Roofing: (Roof Coverings, Roof Openings)

C. INTERIOR

   Interior Construction: (Partitions, Interior Doors, Fittings)

   Stairs: (Stair Construction, Stair Finishes)

   Interior Finishes: (Wall Finishes, Floor Finishes, Ceiling Finishes)

D. SERVICES

Plumbing: (Plumbing Fixtures, Domestic Water Distribution, Sanitary Waste, Rain Water Drainage, Other Plumbing Systems)

HVAC**:** (Energy Supply, Heat Generating Systems, Cooling Generating Systems, Distribution Systems, Terminal & Package Units, Controls & Instrumentation, Systems Testing & Balancing, Other HVAC Systems & Equipment

Fire Protection: (Sprinklers, Standpipes, Fire Protection Specialties, Other Fire Protection Systems)

Electrical: (Electrical Services and Distribution, Lighting and Branch Wiring, Communication and Security, Other Electrical Systems)

E. EQUIPMENT & FURNISHINGS

Equipment: (Commercial Equipment, Institutional Equipment, Other Equipment)

Furnishings: (Fixed Furnishings, Movable Furnishings)

F. SPECIAL CONSTRUCTION

Special Construction: (Special Structures, Integrated Construction, Special Construction Systems, Special Facilities, Special Controls, and Instrumentation)

G. BUILDING SITEWORK

Site Preparation: (Site Clearing, Site Demolition, and Relocations, Site Earthwork)

Site Improvements: (Roadways, Parking Lots, Pedestrian Paving, Site Development, Landscaping)

Site Civil/Mechanical Utilities: (Water Supply & Distribution Systems, Sanitary Sewer Systems, Storm Sewer Systems, Heating Distribution, Cooling Distribution, Other Civil/Mechanical Utilities)

Site Electrical Utilities: (Electrical Distribution, Exterior Lighting, Exterior Communications and Security, Other Electrical Utilities)

Other Site Construction: (Service Tunnels, Other Site Services & Equipment)

Sustainability Goals

As previously mentioned in Chapter 3, the construction efforts shall be met according to strict guidelines of LEED (Leadership in Energy and Environmental Design) and the Living Building Challenge building programs. These are necessary to protect the environment and are not supplemental to the Uniformat criteria, rather they are combined within the construction sequences and practices in order to establish a stage based construct. The Uniformat is part of the National Institute of Standards and Technology development of guidelines for construction estimating and analysis contrasted to LEED and Living Building Challenge, which provide guidelines for sustainable building practice.

The following section represents using the Uniformat Criteria specifically for interpreting CUED's building elements:

A. Substructure

The building is a one-story structural combination of non-load-bearing masonry and steel framed structure supported on both cast-in-place concrete piers resting on pad footings, strip footings, stem walls, and buttresses. As the site borders a flood plain, the structure is partially resting on driven piles to ensure that no formed concrete experience deflection and failure. Piles are placed and capped, and connected to grade beams within the foundation basement floor or crawl space. Reinforced concrete walls will be provided around the perimeter of the basement area. A partial basement area is provided and ICF (Insulated Concrete Form) will be used in the foundation system.

B. Shell

Superstructure. The ground floor is a suspended slab system made of precast planks, combined with precast joists connected to steel framing to two girders as primary support. The basement slab is a partial floating floor slab, with recessed slabs for sump pits and floor drain. The floor deck will be precast concrete planks with a radiant floor heating and cooling system designed within. A precast slab will be provided for noise control and for in-floor heating and cooling convection. The floor deck will be supported by cast-in-place concrete joists with reinforcement bars formed with steel mesh caged pillars per the structural grid. The foundation system is cast in place and reinforced concrete strip footings and stem walls with concrete piers and pads are situated at column locations. The steel columns will be W type, Hollow Steel HSS, and pipe/posts. I-Beam type lateral beams are to transfer heavy loads between columns and down through these columns to the foundation. The transfer beams to be used are both C-channel type or I, or W.

The lateral load resisting system will consist of transfer beams attached to the tower superstructure and repeated at the clerestory levels. The shear wall locations will be at two portions of the building, at the party commons room (also as half-wall units to separate seating from bathrooms) and partially as part of the fireplace structure at the southwest end of the building. A suspended slab system made of precast planks will be combined with precast joists connected to steel framing and to two girders. The building superstructure will be steel: a framed construction for the roof, water tower structure and clerestory space will be made up of steel members. The list below indicates key issues faced within this design especially regarding the building's statics and structural balancing when facing outside forces.

Exterior Enclosure. The exterior and interior (nonload-bearing masonry) are from repurposed CMU, special textured CMU for the purpose of light re-transmittance offering ambient reflected light from the clerestories. An alternative would be for Schist/Gabion walls to be used on the exterior skin instead of 12" CMU Block.

Insulation. In balancing the extremes in outside and inside temperature, as determined by utilizing the psychrometric chart (Figure 60), insulation techniques are to be determined. The insulation needs will meet or be better than LEED, Living Building Challenge, and the Energy Code. Rigid foam board, sealants, and batt insulation are to be determined. However, since the building is using passive solar heating, natural ventilation, and radiant heating and cooling, with dense concrete masonry partitioning being utilized, the need for synthetic insulation is at a minimal. Foam board insulation is to be used at the foundation walls and in the upper clerestory non-void spaces.

Roof. Slate Tile will be used for the roof. The roof deck system will use a thick sheathing spanning over, and fastened to, heavy-duty aluminum roof trusses with purlins. Heavy duty aluminum framing will also be used at the entry and public area doorways. The alternate design of these will consider acceptable storefront systems using other metals from pre-used sourcing.

Fenestration. By using the psychrometric chart (Figure 60), design techniques utilized such as passive solar heating will be dictated by the placement of openings. A large medium-width channel is created at the intersecting axes clerestories so that a steady amount of sunlight will radiate and re-radiate the concrete interior, which will, in turn, retain the sunlight's energy and this shall generate thermal lag. The clerestory, as a major conduit opening, offers excess heat to escape as part of its natural heat chimney effect. This is in conjunction with the specifications for balancing, as stated in 07 Thermal and Moisture Protection, mitigating condensate in the building. Ground level fenestration and storefront doors are designed to fit in with the traditional style of the building and are durable with low emissivity hardware and craftsmanship.

The building fenestration is made up of the following:

- Storefront Aluminum
  - Low-E Glazing, UL Rated Aluminum frame
- Exterior Doors

- Low-E Glazing, UL Rated Aluminum frame

- Aluminum Frame Casement Windows
- Interior Doors
- Louvers

C. Interior

Wood blocking is used to reinforce bathroom equipment in each of the four Handicap Accessible Unisex bathrooms. Interior walls are 6-inch CMU and painted on both sides with a Low VOC (Volatile Organic Compound) paint. Wood finishes and trim are on furring strips fastened to the masonry block. A wooden floor in the commons shall be made out of reclaimed bowling alley wood planks. Painting in the clerestory will be done with low VOC paint. Reflective corrugated metal will also be used in the clerestory to help diffuse daylight.

D. Services

Plumbing. The CUED project consists of designed mechanical systems for an ecological education facility in Geneva, New York. Premium integrity products and locally purposed, adaptively efficient systems will be used as the mechanical design basis. Mechanical systems and components utilized will be recognizable to local builders and the facility manager to capitalize functionality in operations, system efficiencies, and duration of maintenance. This information outlines the scope of the mechanical systems design but does not include all information regarding integrated systems. Some systems will require ongoing redesign and trial and error development based on seasonal conditions. In order to adhere to the Living Building Challenge, no PVC piping will be used within this project.

Domestic Hot Water. Domestic hot water will be stored in an above ground tank and heated through tankless hot water converters. Another smaller raised tank will store solar-heated water. Power for the pump equipment will be supplied from various renewable resources either directly through existing utility hookups to be connected to the building or stored through one of four EnergyCell RE High Capacity 48V Battery System, 2770AH 4X6 Cell Configuration, Top Termination Lithium Ion batteries. All lithium battery cell types are to be located safely in a dry location within the utility tower.

HVAC - Ventilation and Fan Systems. The interior volume control ventilation will have a single supply duct as per the VAV (Variable Air Volume) ventilation system. HVAC - Heating System is part of the Geothermal Radiant Floor.

Duct insulation

Ventilation/Air-conditioning. Supplemental to louvers, operable clerestory windows. Partially powered by Life Wall system; (2-4) units installed in building's available space.

Exhaust Fans. Supplemental to louvers and operable clerestory windows. Partially Powered by Life Wall system, (2-4) units installed in building's available space. (Figure 83) shows the Life Wall specifications to be used as either one or several installed systems.

Automatic Controls. An underground cold water main will serve both the potable water and automatic sprinkler system for the building. The sprinkler header will be located in the Boiler Room and will consist of a double check backflow preventer and wet valve. The wet valve will serve a sprinkler system for all interior portions of the building including warm attic spaces with dry recessed pendent heads protecting entryways. Sprinkler heads are to be recessed pendent heads in all occupied areas with ceiling space or sidewall heads with no ceiling space. Standard pendant heads will be acceptable in all unoccupied rooms such as storage and custodial rooms where surface mounted lights are utilized. Ceiling space is anticipated to be combustible and so will need to be sprinklered also.

Life Wall
Application: Single Family / TownHome
Space Heating, Cooling, Domestic Hot Water, Air Ventilation, Home Automation, Battery Backup
Energy Source: Solar (PV)
Heating Capacity: 18,000 - 44,000 BTU
Cooling Capacity: 16,000 - 42,000 BTU
Domestic Hot Water: 50 Gallon
Energy Storage: 30 kWh
Solar PV Size: 7kW-11kW (DC STC)
Dimensions: 36"D x 72"W x 96"H
Home Size Compatibility: 500-1700sqft (Home Capability dependent on energy efficiency)

Figure 83. Life Wall specifications for (1) Life Wall System – Courtesy Small Grid, Geneva, NY

E. **Equipment and Furnishings**

All furnishings shall be built from sustainable forest stewardship program woods, locally accessed and will access pre-used equipment and furniture from local sources. No equipment or furniture will be made with materials using micro-density-fiberboard or chemicals.

F. Special Construction

Water Tower Construction (Figure 77). A gravity tower above ground water tanks will be situated above the vestibule at main entrance in a steel tower with deck platforms at staged levels. The tower will have an access stair and hatch door at the top. The top deck will be a roof garden with a small green roof system.

G. Building Sitework

Sitework. The project existing site slopes from the southwest to the northeast at an average slope of approximately 2.9%. There is a 9’ elevation difference across the site, from the highest point at the existing parking lot (520'- 0") at the southwest corner to the northeast corner’s lowest point (511'- 0"). The steps are to be built and a bridge constructed close to the creek’s edge. Some of the site is on compacted fill with various standing trees. While no geotechnical investigation was done, the following typical site preparation practices have been coordinated with the help of several conversations with the civil engineer. Concrete stepped spread footings are to be used for the foundation on pile caps of 20' deep steel pipe piles concrete filled as prepared. Sheet piles (20' deep) are also to be prepared and driven at a linear foot length of 400’ to hold in an estimated compacted 9' depth of new clean fill (approx. 350 cu. yd.) to raise the entire pad site, while protecting against potential erosion into the creek. Trenches and terracing for the project will provide backfill and the sheet piles will be constructed with concrete or shotcrete. The backfill will be approximately along the sheet pile trench, 160' in length, and use roughly 80 cu. yds. of clean material.

Enhancements along the creek will call for several natural boulders and/or cast-in-place concrete that is formed to mimic the edges of a wild creek with stone. Riparian zones will be integrated into the creek and construction will be accomplished by a licensed landscape architect, biologist specialist, and urban forester. A full-scale geotechnical investigation shall determine the recommended foundation specifics. The structure will have significant dead loads and live loads. Limited over-excavation will be done to remove any wet, loose, and/or unsuitable soils, however, the building will be supported on capped piles and spread footings, so only select regions may require moving. Engineered granular fill beneath the building will be a minimum 4’ thickness. A non-frost susceptible backfill, shot rock, and gravel fill will be below the bottom of the footing elevation with the placement of a sub-grade reinforcing fabric at the bottom of the excavation pits. The bottom of the sub-cut is to be proof rolled and any weak or soft areas removed and backfilled with shot rock and granular material. De-watering of the excavation pit will most likely be required in certain areas, based off of moisture levels. Parking lot enhancements and drop-off zone construction will require removal of a minimum of 24" of existing material to construct a retaining curb. An engineered embankment retaining wall depth of 48" or greater and consisting of granular non-frost susceptible backfill, rip-rap, and gravel fill will be required depending on location. A thicker embankment section may be required if existing soils are poorly drained or have significant fine grain soils. Geotextile fabric is recommended to be placed at the bottom of the excavation limits after the sub-cut area has been proof rolled. Parking stalls shall be determined and delineated with striping and signed with appropriate traffic control signs.

The design of the building incorporates the anticipated interaction with the terrain and urban forest. The carefully facilitated site construction work is the embodiment of the placemaking, urban design, building parti, and hierarchy of spaces. One access node, the bend at Mill/West St., was strategized as a grand stair, somewhat inspired by a larger city park element. This feature, an enhancement, brings a pedestrian scale to an area of the park, which requires a safer descent/ascent along a partial traverse to and from Brook Street Park. These steps both access and generate a promenade above the creek. The grand stair also connects Hildreth Hill to Castle Heights. It bridges neighborhoods in need of direct access to a meditative pocket park environment during walks as opposed to car travel. The proposed site is meant as an attaché to the already popular Brook Street Park, and makes use of this seldom utilized ground, with a new pedestrian access. The following specifications will provide information for understanding the circulation within the building, the structural construction, exterior shell, interior finishes, thermal and moisture protection, plumbing, heating, air conditioning, and ventilation.

*Water service***.** A new steel pipe will be laid and a new water main will be installed at the east of Brook Street, near the southeast corner of the parking lot. A new water main will be installed per requirements to meet potable requirements. One ductile water service will connect to the water main with a tee fitting and gate valve installed prior to the line entering the building. Some asphalt pavement removal and replacement at the existing parking lot will be required for installation of the new water main. It is assumed that there will be adequate water flow and pressure with a water line but this may have to be confirmed during the design development phase of the project. All water system components will follow the current City of Geneva standard specifications and details with anticipated applications for alternate types never used before. This will need to go through a review process with the Buildings and Codes director.

Sanitary sewer service (Option). Options for greywater sanitary sewer systems are currently undergoing review for the Living Building Challenge within this schematic design. Compost toilets, dry toilets, greywater flushing, and rainwater catchment systems are CUED's best case design scenarios. The discharge of wastewater in a Living building is assumed via gravity methods through non-PVC piping. The sanitary sewer services will be designed to accommodate the projected wastewater flows for this Living Building criterion. A new 450 gal. sewage/composting storage tank will be installed (buried 20' deep) near the grand stair near Mill Street and shall also be connected via new 8" non-PVC line from sinks, used for vegetable washing, and all bathroom sinks and laboratory sinks. The water from this tank shall be utilized frequently. The sanitary cleanout shall be installed 50' from the east building wall.

Stormwater system. The site stormwater system is intended to softly propel water into path flows to both irrigate terraced garden boxes, funnel through bio-retention swales and temporary catch basins, before greywater collection in the underground cistern. Valves and piping will be engineered to prevent overflows and will carry stormwater out into the creek. A storm drain structure is built from the project site. A manhole is located at the northwest corner, along the path. Grading of the site will be from the east to the west and will slope into the retaining walls. At the perimeter of both the southeast and southwest sides of the building, a trench drainage system will feed into a collector, ending in the cistern. Overflow surface stormwater will be directed to the creek during flash events and an underground storm collection cistern will be designed not to take water during flash occurrences. A bio-retention system, utilized through terraced gardens is meant to retain and recharge surface water. Stormwater surface runoff flows to the creek at the easternmost part of the site, away from the building and spills into the creek near the proposed footbridge.

Grading of the entire site will be less than 2% on average. The slope from the southwest to the northeast shall spill into the creek, only if needed. All storm bioswales, drain structures, and pipes will adhere to NY State DEC SWPPP (Stormwater Pollution Protection Plan) as standard specifications and details for the design. All catchment grates in the catchment area flowing to the CUED site will be cold-steel formed, imprinted with a fish image and the message “Do Not Dump – Drains to Creek.” Roof drains will traverse direct water through a filtered system and into a greywater collection holding tank in stainless steel drum, at the tower, just 8’to 4’ below depending on the rooflines. This will be used for flushing all toilets. Foundation drains will be stemmed into the cistern, directly below the tower footprint, 15' below the ground floor.

The west parking pad will be a semi-impervious surface made of larger aggregate asphalt remilled from existing asphalt. The drainage from this lot will also flow to CUED’s site and will have to be redesigned according to SWPPP. Bioswales will collect this runoff for use in a garden space with native aquatic plants. It is assumed that some contaminated surface stormwater, during extreme flash events may spill over into the terraced gardens and spill into the catchment /cistern. Contaminants from parking lot surface runoff will have to be captured and meticulously filtered. No PVC is to be used in any aspect of CUED’s stormwater control system.

Codes and standards. The following are the latest editions of the codes and standards that are used.

- International Building Code, 2015 Edition.
- American Society of Civil Engineers, Minimum Design Loads for Buildings and Other Structures SEI/ASCE 7-02
- American Concrete Institute (ACI), Building Code Requirements for Structural Concrete ACI 318-02.

- American Institute of Steel Construction (AISC), Allowable Stress Design, Ninth Edition.
- American Institute of Steel Construction, Seismic Provisions for Structural Steel Buildings, ANSI/AISC 341-02 f

The building will also need to have proper engineering for the following design loads:

- Roof – Snow Load
- Wind Load
- Seismic Loads

Conclusion

In conclusion, this chapter has dealt with the necessary construction criteria as a schematic design solution and has been presented to emphasize the practicality of a structural usage and construction interpretations of a desired dwelling. The standard practices and sequences are presented in this chapter along with drawings and renderings to convey the building's intent of design and peoples' interdependence on engineered representations. The guidelines presented in this chapter showcase the set principles and building trends practiced today. However, Chapter 5 presents supplementary criteria not explored in Chapter 4 and offers opportunities to cover anything missed in previous chapters regarding the building components.

Chapter V: Summary, Recommendations, and Conclusions

Summary of Findings

SHPO, or State Historic Preservation Office, helps communities to maintain their character of the fabric and architectural typologies. Geneva reflects its philosophical approach to preservation perfectly. All new buildings must undergo a stringent review process by the local architectural review board in order to meet the requirements for preservation and compatibility. The CUED is characterized as a park lodge like one might find in state parks such as the Alleghany State Park, the Catskills, or the Adirondacks. Certainly, every lodge- and pavilion-like structure or NY State Thruway facility has influenced the lodge style of CUED. The New York State Department of Parks, Recreation, and Historic Preservation has maintained the cherished collection of original CCC (Civilian Conservation Corps) designed pavilions in its state parks dating back to the Great Depression. This is why today when we go to a state park, we find the consistent character of these buildings. The statewide approach to design cataloging, recording of typologies, preservation, and the well-maintained aspects of structural integrity have been a major source of inspiration to the style and design program of CUED. It is recommended that SHPO, state, as well as local Ontario County and Geneva Historical society maps, are used to identify any cultural disturbances and/or discoveries are within the construction scope of the work, during excavation. Perhaps one of the most important findings towards this research was the decision to design something that will have an everlasting effect on the community: a structure reflecting the strong foundations of Geneva's historical character. If anything else, the city is a showcase of its history.

Stormwater Control

The New York State Stormwater Pollution Prevention Plan (SWPPP) was something only vaguely understood prior to this research. The decision to design along a major creek, and within the parameters of the Living Building Challenge (LBC), meant that the civil engineering and landscape architecture needed to comply with several key criteria. These meet the LBC as it is aligned with SWPPP, as New York State's Department of Environmental Conservation (DEC) mandates strict erosion control and pollution prevention during construction. A lesson learned from this research is geared towards better understanding all the meticulous design efforts that the civil engineer must sign-off on in order to execute any building project near a stream, lake, or river. Important geotechnical surveying, groundwater modeling, and geological studies must be made for deep foundations and geothermal well drilling while protecting water pathways during the initial and lasting life cycle of the building.

As an enhanced method towards resilient urban designing in stormwater control, it is essential that creek management means an ecological balance must be made to densely planned communities. This aids in eliminating polluted runoff, which can affect the habitability of the region. Thus, stormwater system re-designs are just as important as structures or buildings of the most stringent green building philosophies. Subsequently, climate change is a reason for buildings to both mitigate carbon emissions and address causes relating to structural integrity, which ultimately leads to better durability to withstand erosion caused by torrential rain events. In selecting a site close to the flood zone for Castle Creek, an important investigation into proper structural anchoring and working closely with a structural engineer, allowed for the better understanding of deep foundation designing.

Pedagogy

The pedagogy behind CUED, as a green building, utilizing Living Building Challenge criteria is recommended to be interpreted widely in literature, in signage, and in graphic depictions within the building. This is meant to be the focused lexicon around the spaces people visit initially and regularly. More buildings could also be converted into prototypes, like CUED. CUED is focused on each individual in the environment, especially those seeking watersheds in and around Geneva as well as those partaking in a general Seneca Lake education.

Geothermal, Sun, Water and Wind: Naturally Resourceful

In the correct hydraulic placement, micro-hydro power turbines have proven highly efficient as cost-effective devices that generate off-the-grid power, with some limitations such as availability of consistent flows of strong enough currents. However, according to the World Energy Council (2016) hydropower accounts for 71% of the nation's renewable electricity generation and about 16.4% of the world's total electricity (World Energy Council, 2019). Just like wind-power, micro-hydro power is completely renewable and is a reliable natural process of the earth's weather or wind systems. The application of natural resources to CUED is paramount towards a living building. While many renewable resources are available to help satisfy CUED's energy consumption, CUED shall rely on two (valid) ones. Micro-hydro power can be delivered completely as a renewable resource, directly from the natural environment. Mills and windmill powered agricultural wells are driven on gear-and-drive belts from shaft driven connections offering mechanical momentum as energy.

Present day systems and research projects based on capturing human energy seem to be focused on micro-systems or low power energy systems. Upon discovering a type of turbine used by farmers in Northern Ireland, future research should prove it is possible to harvest energy with better efficiency to serve a high power system. A range of validated average energy outputs was stated to have a better carbon footprint and offsetting carbon emission by "a savings of 484 tonnes or more of Carbon Dioxide (CO_2)" (Ecoevolution.ie, 2012). The average amount of energy consumed will need to be further researched to determine closer results. The new average will provide a maximum amount of harvestable energy. Of course, no one energy system will be 100% efficient.

The CUED project fully intends to use all New York State Energy Development Authority (NYSERDA) "Green Communities (NYSERDA, 2017)" incentives, such as Renewable Heating and Cooling. These are to be developed from geothermal, solar water heating, passive solar, and wind. On-site renewable energy facilitation or off-site purchasing of REC's (Renewable Energy Credits) will be made. This author also intends to explore options similar to what Auburn, NY did with a deep geothermal resource in 1982 (before converting it to an on-site natural gas feature for a local school). Since Auburn is close to Geneva, these opportunities are assumed to be similar since the Seneca Lake Basin is in a favorable geo-location for tapping geothermal energy (NREL, 2016). The Auburn 1981-1982 project piloted a geothermal well was an important exploration towards geothermal resource development in the Finger Lakes. According to a May 1988 scientific report: The New York State Department of Environmental Conservation's *DRAFT Generic Environmental Impact Statement on the Oil, Gas, and Solution Mining Regulatory Program: Vol 1.,* "Chapter 5: New York State Geology and its Relationship to Oil. Gas and Salt Production", the "geothermal gradient" temperature is higher at greater depths. This increases at the rate of 15° C per kilometer or 10° F per 1,000 Feet" (pg. 34)**.** Alternately, non-deep (shallow dug) geothermal wells may also be utilized because deep wells could be subjected to seismic shift and this could sever well-shaft equipment (Cook, 2018). For net-zero energy consumption, CUED intends to store energy directly from its roof-mounted photovoltaic array as shown in

Figure 81, with lithium-ion batteries as featured in Figure 82. A study was done in the summer of 2015 with a consultant and former RIT graduate architecture student, James Reynolds, to help determine the most efficient placement for PV panels on CUED. Figure 82 shows a zoned roof diagram of this placement.

Self-Assessment of International Living Futures Institute Standards for 3.1 Criteria

A conclusion, rather preclusion, was made to use an alternate green building platform, in lieu of USGBC's LEED program, simply for opting to evaluate its alternative methods. This project has utilized a building philosophy of sound principles for carbon net neutrality. Since there was to be a garden component to the building, the site and water aspects have been incorporated from the Living Building Challenge (LBC). Additionally, the nature of the site chosen to work with underwent several assumptions as to CUED's constructability with slope challenges, site preparation, and establishing a raised pad site. Conservation methods needed to adhere to the LBC. While construction efforts can change the course of the design, it is important as part of this mission to maintain the direction of the LBC goal. It is recommended that no such substitutions be made that would affect the Petal Project criteria. The following criteria are the fundamentals of the ILFI (International Living Future Institute) building philosophy for Living Building Challenge, and a subset of information for the 3.1 program, and describes what may be assumed this building has achieved. The assessment has revealed that the building will match some of the seven performance areas. In evaluating the Petals' criteria, a checklist has been created with a self-checking key: Yes (Y) / No (N) / To Be Determined (TBD) for performance areas within the petals Place, Water, Energy, Health, Materials, Equity, and Beauty (Table 4).

TABLE 4

INTERNATIONAL LIVING FUTURE INSTITUTE PETALS CHECKLIST

Yes	No	To Be Determined	Petals Criteria	Criterion	Specific Examples
			PLACE		
✓	☐	☐	Responsible Selected Place		
✓	☐	☐	Responsible To Habitat		
✓	☐	☐	Habitat Exchange		
			WATER		
✓	☐	☐	Net Positive Water:	Rain Garden Infiltration	
☐	✓	☐	Net Positive Water:	Tidal Wetland Blackwater Treatment	
☐	☐	✓	Net Positive Water:	Wastewater Collection	
✓	☐	☐	Net Positive Water:	Recycled Water Distribution	
✓	☐	☐	Net Positive Water:	Rainwater Storage Tank	
✓	☐	☐	Net Positive Water:	Flowthrough Planters	Green Roof
			ENERGY		
✓	☐	☐	Net Positive Energy	Geothermal	
✓	☐	☐	Net Positive Energy	Solar	
☐	☐	✓	Net Positive Energy	Micro Hydro Power	Madias Site
✓	☐	☐	Net Positive Energy	Wind	Zotos Partnership
			HEALTH		
☐	☐	✓	Net Positive Health	Human Thriving	
			MATERIALS		
✓	☐	☐	Net Positive Material Health	Red List Compliant	
✓	☐	☐	Net Positive Material Health	Sourcing From Local Economy	
✓	☐	☐	Net Positive Material Health	Utilizing Responsible Industry	
✓	☐	☐	Net Positive Material Health	Net Positive Climate	
☐	☐	✓	Net Positive Material Health	Net Positive Waste	
✓	☐	☐	Net Positive Material Health	Product Fit to Use	
☐	☐	☐	Net Positive Material Health	Useful Life Disposal	
			EQUITY		
✓	☐	☐	Equity Product Access		
☐	☐	✓	Responsible Co-Products		
☐	☐	✓	Equitable Investments		
☐	☐	✓	Just Organizations		
			BEAUTY		
☐	☐	✓	Positive Hand = Printing		
☐	☐	✓	Beauty and Spirit		
☐	☐	✓	Education and Inspiration		

Conclusion

Emphasizing a need to understand historical watersheds benefits urban ecologies worthy of bringing people to the table to discuss treating its own watershed better. The placement of this paper's sustainable design, in a site near a creek will be the contemplative space needed to address perceptional values of community related to Castle Creek. Because of surveys conducted within this thesis, which discovered that an important dialogue has in fact already been established within this community: ecological adaptation of many close-knit places already boasts of a keen sense of place in Hildreth Hill and Castle Height districts. Just as the Kanadeseaga used, a fortress supported the spirit and attitudes of preservation of place and offered ambassadorship toward sustainability. In CUED, an urban "grange" is perhaps present not only in a building such as CUED, but in a phenomenological understanding of sustainable environs that would welcome a "Living Building" as per the International Living Future Institute. Geneva, its rich history, its colleges, and the agricultural impression that is placed on its spatial pattern, intricate to proper dialogue, in fact, is a reflection of CUED's existensialism. That is, this proposal exists in a unique environment akin to architecture and design, or historical preservation, so much so that it seems natural for this author to develop a building which mimics the behaviors of the neighborhoods around the Creek. Design goals are simple enough, and straitforward in this paper, but without further accomplishments developed here, through literature reviewing, sustainable design case studies, empirical studies, or the investigatory walking of a creek, this paper would indeed have many gaps in information. Through methodological approaches such as photodocumenting the aftermath of a superstorm's effect of erosion, or sketching a parti design which breaks down geometry into a simple footprint – we arrive at a further intrinsic meaning of "place". It is profoundly interesting to examine history where water is present, and find streets around it providing for municipal infrastructure, such as the old water pipes of ancient Geneva. In parks and people places, pavilions and protectant spaces, through resourceful citizens, there is always a will of sustainability working. But because of the fundamentals of the architectural programming process, offered in this paper, through schematic and design development levels - a basic design that includes everyone could not have been achieved for the benefit of this community. This paper is the result of over 5 years of research. Within that time, the environs around Castle Creek changed due to events effected by weather (creek erosion), local economics (Madias supermarket), or even simple events such as human life cycles within the community (birth, life, death). The paper has focused on an architectural design that might absorb the ebb and flow of a creek as much as knowing a past commonwealth, in the spirit of a mill, borrowing from its archeological practicality and its industrial ecological stewardship. The CUED method is meant as a universal template for promoting transect studies, new urbanism, but emphasizing the preservation of landscapes once known to geologists such as Leopold, or even Mack, or Digman. The philosophy behind the CUED building is used to promote walkability and understand the river daylighting methods of today's urban planners. It is used to capture both rainwater, stormwater, solar energy, and to offer a site for permaculture – in gardens and communal efforts. Water is always present next to this building, within the building, and is the discussion and debate within its confines.

This paper has accompanied to it an online presentation (https://prezi.com/gsfdz6oieykt/center-for-urban-ecological-dialectics-cued/) which provides a mind mapping approach to understanding philosophical and practical elements behind the building. The author encourages the reader to visit it.

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